

PHYSICAL  
Sci. LIB.

TK  
6544  
S28

UC-NRLF



B 3 756 504



LIBRARY  
UNIVERSITY OF CALIFORNIA  
DAVIS

Digitized

Original from  
UNIVERSITY OF CALIFORNIA



A *Howard W. Sams*® PHOTOFACT PUBLICATION

# DICTIONARY OF Electronics Communications TERMS

by THE HOWARD W. SAMS ENGINEERING STAFF

- Complete and up-to-date definitions for communications terms applicable to two-way radio, broadcasting, microwave, amateur, and CB radiocommunications systems, equipments, and principles.

- Over 2,500 entries
- Clear concise definitions
- Authoritative and up to date
- Completely cross-referenced
- Includes multiple meanings

Digitized by Google  
Original from  
UNIVERSITY OF CALIFORNIA







# **DICTIONARY OF ELECTRONICS COMMUNICATIONS TERMS**







**\$3.95**

Cat. No. COM-1

# **DICTIONARY OF ELECTRONICS COMMUNICATIONS TERMS**

by

**The Howard W. Sams Engineering Staff**

LIBRARY  
UNIVERSITY OF CALIFORNIA  
DAVIS

**HOWARD W. SAMS & CO., INC.**

**THE BOBBS-MERRILL COMPANY, INC.**

*Indianapolis • New York*



Digitized by Google

Original from  
UNIVERSITY OF CALIFORNIA



**FIRST EDITION**  
**FIRST PRINTING — JULY, 1963**

**DICTIONARY OF ELECTRONICS  
COMMUNICATIONS TERMS**

**Copyright © 1963 by Howard W. Sams & Co., Inc.,  
Indianapolis 6, Indiana. Printed in the United States of  
America.**

**Reproduction or use, without express permission, of edi-  
torial or pictorial content, in any manner, is prohibited.  
No patent liability is assumed with respect to the use of  
the information contained herein.**

**Library of Congress Catalog Card Number: 63-17018**

# PREFACE

An accurate definition of a technical term is not always clear. Sometimes a meaning is obscured by the words used in the definition or by not going into the subject far enough to be useful to the layman. Often a technical term can be best explained by referring to other closely associated terms.

*Dictionary of Electronics Communications Terms* provides all these coverages in a practical up-to-date reference of technical terms pertinent to all phases of radiocommunications. Many slang and colloquial terms which have found their way into common usage are also included to make this a complete "one stop" reference. These terms and their true meanings have heretofore been subject to general interpretation by those working in the electronics field, and they are not normally set forth in a volume of this type. In this book, however, such terms as *fist*, *bottle*, and *rock*, even though they have no apparent connection with electronics or communications, are actually quite commonly used terms and are fully defined.

All terms are cross-referenced whenever possible to place related entries in the same area. For example, under *diversity receiver* you will be referred to "receiver, diversity." Here you will find a description of this receiver amidst a listing of all other receiver types. In addition, where a term has more than one meaning, all related terms are also referenced in order to provide a more comprehensive understanding of the term. Each definition is presented in a straightforward manner and in language that can be understood by persons having only a

basic knowledge of electronics. Additional information beyond that required for explanation is also included in many cases.

This dictionary is designed to serve the needs of engineers, electronics technicians, students, hobbyists, CB'ers, radio amateurs, and everyone connected in any way with the field of electronics and radiocommunications.

A handwritten signature in black ink, appearing to read "Lewin H. Sams". The signature is written in a cursive, flowing style.

June, 1963



## A

- A**—Abbreviation used to denote: (1) ampere, (2) angstrom, (3) filament-voltage supply.
- A battery**—*See* battery, A.
- AB power pack**—*See* power pack, AB.
- absorption, atmospheric**—The process by which one energy form is lost into the atmosphere by being converted to another energy form.
- absorption circuit**—Usually a tuned circuit that extracts energy from an associated circuit.
- absorption frequency meter**—*See* meter, absorption frequency.
- absorption, ground**—A loss of energy incurred in the transmission of radio waves due to the dissipation of energy at those frequencies where currents are induced in the ground.
- absorption loss**—The energy loss due to conversion of one energy form into another form by the conducting or reflecting medium.
- absorption marker**—*See* marker, absorption.
- absorption modulation**—*See* modulation, absorption.
- absorption wavemeter**—*See* frequency meter, absorption.
- AC**—Abbreviation for alternating current. *See* current, alternating.
- AC generator**—*See* generator, AC.
- acorn tube**—*See* tube, acorn.
- acoustic**—Pertaining to the production and propagation of sound.
- activity, crystal**—*See* crystal activity.
- Adcock antenna**—*See* antenna, Adcock.
- Adcock direction finder**—*See* direction finder, Adcock.
- adjacent-channel interference**—*See* interference, adjacent-channel.
- adjacent-channel selectivity**—*See* selectivity, adjacent-channel.
- aerial**—*See* antenna.
- AES**—Abbreviation for Audio Engineering Society.
- AF**—Abbreviation for audio frequency.
- AFC**—*See* automatic frequency control.
- AGC**—*See* automatic gain control.
- A I E E**—Abbreviation for American Institute of Electrical Engineers.
- alarm, auto**—An alarm that is actuated automatically when an associated receiver, tuned to the international distress frequency, receives an alarm signal.
- Alexanderson alternator**—*See* alternator, Alexanderson.

**Alford-type antenna**—*See* antenna, square-loop.

**align**—To bring into a straight line. To adjust tuned circuits for a desired response.

**alignment**—The procedure or final result of adjusting the tuned circuits in electronic equipment.

**alkaline cell**—*See* cell, alkaline.

**all-pass network**—*See* network, all-pass.

**all-wave antenna**—*See* antenna, all-wave.

**all-wave oscillator**—*See* oscillator, all-wave.

**all-wave receiver**—*See* receiver, all-wave.

**allocation, frequency**—*See* frequency allocation.

**alnico**—An alloy of aluminum, nickle, cobalt, and iron used to produce magnets having relatively permanent characteristics.

**alpha (A)**—Greek letter used to designate the current amplification of a transistor.

**alpha cut-off**—The frequency at which the current gain of a transistor is 3db down from its low-frequency, current-amplification value.

**alternator**—A device used to convert mechanical energy into alternating electrical energy.

**alternating current (AC)**—*See* current, alternating.

**alternator, Alexanderson**—An early type of alternator used to produce radio waves.

**AM**—Abbreviation for amplitude modulation.

**amateur band**—*See* band, amateur.

**amateur call letters**—Identification that is systematically assigned by the FCC. With few exceptions, it consists of a sequence of one or two letters followed by a numeral that designates the call area and then two or three additional letters.

**amateur operator**—A person that has a purely personal interest in radio techniques and holds a valid license that authorizes him to operate licensed amateur stations.

**American Morse code**—*See* Morse code, American.

**ammeter**—An instrument for indicating the amperes of current in an electric circuit.

**ampere**—A standard unit of current designated as the amount of current that will flow when one volt of emf is applied across one ohm of resistance. An ampere of current is produced by one coulomb of current passing a point in one second.

**ampere hour**—A unit of meas-

urement equal to one ampere flowing for a period of one hour.

**ampere-turn**—A product of the number of coil turns and the amperes of current in the circuit. A measure of magnetomotive force.

**amplification**—An expression for the difference between input and output signals in a circuit.

**amplification, nonlinear** — Type of amplification that takes place when a tube or transistor is operated on the curved portion of the characteristic curve. Non-linear amplification results in a distorted output signal.

**amplifier** — A mechanical or electrical device used to increase voltage and current. (*Also see class.*)

**amplifier, broadband** — An amplifier that has a relatively flat response over a wide range of frequencies.

**amplifier, cascade** — An amplifier composed of more than one stage with the output of one stage connected to the input of the following stage.

**amplifier, cascade** — A two-stage amplifier in which the two tubes are operated in series with the DC supply, and the grid of the second stage is maintained at signal ground.

**amplifier, cathode-follower**—

*See* amplifier, grounded-plate.

**amplifier, common-base** — A transistor amplifier stage in which the base terminal is common to both input and output signals.

**amplifier, common-collector** — A transistor amplifier stage in which the collector terminal is common to both input and output signals.

**amplifier, common-emitter** — A transistor amplifier stage in which the emitter terminal is common to both input and output signals.

**amplifier, Doherty**—A circuit arrangement devised by W. H. Doherty to increase the efficiency of an ordinary linear amplifier that is handling a modulated wave.

**amplifier, emitter-follower** — *See* amplifier, common-collector.

**amplifier, final**—The last RF stage of a transmitter; that stage which delivers RF energy to the radiating system. Also referred to as the power amplifier, or simply, the final.

**amplifier, grounded-cathode**—An amplifier stage in which the cathode is common to both input and output signals. Most widely used amplifier circuit.

**amplifier, grounded-grid** — Amplifier in which the con-



trol grid is at signal ground. The input is between the cathode and ground; the output is between the plate and ground.

**amplifier, grounded - plate —**

An amplifier in which the plate is common to both input and output signals. The input is between the control grid and ground; the output is between the cathode and ground. Also called cathode follower.

**amplifier, linear**—An amplifier in which the plate current changes in direct proportion to grid voltage; the output is a true reproduction of the input signal.

**amplifier, paraphase** — *See* phase inverter.

**amplifier, speech**—A Class-A amplifier usually having a limited audio frequency response, used for amplification of voice signals, i.e., such as signals from a microphone.

**amplify**—To increase voltage or current by mechanical or electrical means.

**amplitude**—The magnitude of a simple wave or part of a complex wave. The largest, or peak value, as measured from zero.

**amplitude distortion**—*See* distortion, amplitude.

**amplitude limiter** — *See* limiter, amplitude.

**amplitude modulation(AM)**—

*See* modulation, amplitude.

**analyzer, harmonic wave** — *See* wave analyzer, harmonic.

**amining a multiple-harmonic**—A device for examining a multiple-harmonic signal by heterodyning it with a VFO. The resultant beats are separated by filtering.

**analyzer, spectrum** — An instrument capable of resolving and displaying the frequency components of a complex signal or waveform, including the relative amplitude or power of each.

**angle, critical (antenna)**—The maximum angle at which a radio wave may be emitted from an antenna and still be returned to earth by ionospheric refraction or reflection.

**angle modulation**—*See* modulation, angle.

**angle of arrival**—Angle at which a radio wave strikes the receiving antenna with reference to the earth's surface.

**angle of beam**—That angle containing the greatest portion of RF or light energy in a highly directional communications system; i.e., microwave and infrared communications.

**angle of lag**—The angle at which two given quantities are displaced with respect

to each other. One is said to lag while the other leads; i.e., voltage lags current in a capacitive circuit.

**angle of lead**—The angle at which two given quantities are displaced with respect to each other. One is said to lead while the other lags; i.e., current leads voltage in a capacitive circuit.

**angle of radiation**—The angle at which the majority of RF or light energy is radiated with respect to the earth's surface.

**angle of reflection**—The angle between a radio wave or beam of light and a reflecting surface.

**angle of refraction**—The angle of bending that occurs when radiation passes from one medium to another (assuming different indexes of refraction).

**angstrom unit (A)**—A unit of measurement of a wavelength of light or other radiation, equal to  $10^{-8}$  cm.

**angular frequency**—*See* frequency, angular.

**angular phase difference**—*See* phase difference.

**anion**—A negatively charged ion which, during electrolysis, is attracted toward the anode. A corresponding positive ion is called the cation.

**anneal**—To heat and then slowly cool any solid ma-

terial such as metal or glass. This generally lowers the tensile strength of the material.

**annealed wire**—*See* wire, annealed.

**annunciator**—Any device that indicates, by aural or visual means, the reception of a signal; i.e., "on-the-air" lights and indicator lights. Announces an occurrence.

**anode**—(1) The internal electrode of a device toward which the electrons flow, (2) The external terminal from which electrons flow.

**anode modulation**—*See* plate modulation.

**anode power input**—*See* plate power input.

**anodize**—A chemical process in which an oxide coating is produced on the surface of a metal.

**antenna**—A device used for radiating or receiving RF energy. May be thought of as a transformer used to transform a space wave into a guided wave (receiving) or a guided wave into a space wave (transmitting). An antenna can be a simple length of wire, or an elaborate array of conductors and insulators. When a high-frequency current flows in a conductor, a portion of the energy is radiated into space. Also, when a conductor, inter-

cepts a space wave, an electric current is induced in the conductor. Thus, a properly designed array of conductors will provide relatively efficient transformations between guided waves and space waves. (*Also see specific type.*)

**antenna, Adcock**—A pair of vertical antennas separated by one-half wavelength or less and connected in phase opposition to produce a figure-eight directional pattern.

**antenna, Alford-type** — *See* antenna, square-loop.

**antenna, all-wave**—An antenna designed to radiate or receive signals over a given, wide, band of frequencies.

**antenna, aperiodic** — A constant-impedance nonresonant antenna.

**antenna array**—A group of antenna elements arranged to provide specific directional characteristics.

**antenna, artificial** — *See* antenna, dummy.

**antenna bandwidth**—The frequency range of an antenna over which signals may be efficiently transmitted and received.

**antenna, base-loaded**—A vertical antenna whose electrical length is increased by a series inductance at the base of the antenna.

**antenna, beam**—An antenna

that concentrates its transmitted energy in a relatively narrow beam, thus affording high gain.

**antenna, bent**—A center-fed, half-wave dipole with the ends bent downward. This antenna is used where better operation is desired than can be obtained from a quarter-wave antenna, but where space does not permit the erection of a full half-wave antenna.

**antenna, Beverage**—*See* antenna, wave.

**antenna, biconical**—An antenna formed by two conical conductors that have a common axis and vertex, and are excited at the vertex. Also called conical.

**antenna, bilateral**—An antenna, such as a loop, having maximum response in opposite directions.

**antenna, broadband**—An antenna that is capable of receiving a wide range of frequencies.

**antenna, broadside**—An antenna whose direction of maximum radiation is perpendicular to the line or plane of the array.

**antenna, cage**—An antenna comprised of a number of wires connected in parallel and arranged in the form of a cage. This is done to reduce the copper losses and increase the effective



capacity.

**antenna, center-loaded** — An antenna having a loading coil or similar device located at the approximate center of its electrical length. The loading coil is generally employed on vertical antennas.

**antenna changeover relay** — See relay, change-over.

**antenna, clover-leaf**—An antenna consisting of four loops connected in parallel across a coaxial line. The antenna has a doughnut-shaped pattern with a null in the axial direction.

**antenna, coaxial**—An antenna that appears as a quarter-wavelength extension of the center conductor of a coaxial cable. The outer conductor is connected to (and covered with) a quarter-wavelength sheath.

**antenna coil**—See coil, antenna loading.

**antenna, collinear**—An antenna array in which half-wave elements are arranged end-to-end on the same vertical or horizontal line.

**antenna complex**—That circuit or device in a radio transmitter which transfers RF energy from the tank circuit of the final RF amplifier to the antenna system. It may also be employed to match the plate-tank impedance to the im-

pedance of the transmission line.

**antenna, conical**—See antenna, biconical.

**antenna, corner reflector**—An antenna consisting of a primary radiating element and a dihedral corner reflector formed by the elements of the reflector.

**antenna counterpoise** — See counterpoise, antenna.

**antenna, cubical quad** — An antenna comprised of a square-loop driven element and a square-loop parasitic reflector. Also called quad antenna.

**antenna, cylindrical** — See antenna, coaxial.

**antenna, diamond** — See antenna, rhombic.

**antenna, dipole**—A radiating element usually broken into two segments and fed at the center. It provides a radiation pattern which is maximum in the plane normal to its axis.

**antenna, directional**—An antenna having characteristics which cause it to radiate or receive RF energy more efficiently in one direction than in another.

**antenna, directivity**—See directivity, antenna.

**antenna director**—A passive element positioned a specific distance from the radiating element to concentrate, or direct, the radia-

tion in one general direction, thereby increasing the gain in that direction.

**antenna, discone** — A wide-band antenna consisting of a disc mounted above a cone-shaped ground plane. It has a low angle of radiation.

**antenna, doublet**—A center-fed dipole of one-half wavelength or less.

**antenna driven element**—See antenna radiator.

**antenna, dummy** — A device which simulates the impedance and power-handling capabilities of the antenna, but which does not readily radiate RF energy. It is used primarily for transmitter testing and adjustment.

**antenna element**—Any active or passive element of an antenna array that contributes directly to the radiation or reception of RF energy.

**antenna, endfire**—A linear or cylindrical antenna having its direction of maximum radiation parallel to the long axis of the array.

**antenna, fanned-beam** — A unidirectional antenna consisting of elements so designed that the transverse cross sections of the major lobes are almost elliptical.

**antenna, fishbone**—An antenna consisting of a series

of coplanar elements arranged in collinear pairs and loosely coupled to a balanced transmission line.

**antenna, folded dipole** — An antenna (usually a half wave length) comprising two parallel, closely spaced, dipoles. Both are connected together at their ends; the feed point is at the center of one dipole.

**antenna gain** — See antenna power gain.

**antenna, ground plane** — A quarter-wave, vertical radiator set above a circular disc that is one-half wavelength in diameter. Several variations of this antenna use skirts, cones, or wires to provide a ground plane. (*Also see counterpoise.*)

**antenna, half-wave**—Any antenna having a radiating element that is electrically one-half wavelength at the frequency for which it is tuned to operate.

**antenna, halo**—A dipole that is shaped into a circle with the ends capacitively loaded. The antenna can be tuned by adjusting the capacitive loading.

**antenna, harmonic** — An antenna that is longer than one-half wavelength. Also called a long-wire, or harmonic, antenna.

**antenna, helical**—An antenna that has a driven element

## **antenna, helically wound**

shaped like a helix and mounted axially over a ground plane. This antenna is used for the transmission or reception of circularly polarized waves.

### **antenna, helically wound —**

Usually a vertical antenna comprised of a conductor wound in a helical, or spiral, arrangement about a Fiberglas or similar non-conductive rod.

### **antenna, Hertz —** A center-fed, half-wave dipole.

### **antenna, horizontal —** An antenna that has the driven element positioned horizontally with respect to a ground plane or the earth's surface.

### **antenna, image —** The RF equivalent of a mirror reflection. A real antenna supported one-half wavelength above a perfectly reflecting ground produces a reflected signal that appears to originate from another antenna spaced one half wavelength below ground.

### **antenna impedance—***See* impedance, antenna terminal.

### **antenna, inverted-L—**An antenna composed of a vertical and a horizontal radiator in the shape of an L. The antenna is driven from the lower end of the vertical leg.

### **antenna, linear—**An antenna

## **antenna parasitic element**

consisting of a number of short radiators arranged in a straight line.

### **antenna loading coil —** *See* coil, antenna loading.

### **antenna lobe—***See* lobe, antenna.

### **antenna, long-wire—**Any of a series of antennas that use conductor lengths in excess of one-half wavelength. These antennas include the beverage, wave, helical, rhombic, etc.

### **antenna, loop —** An antenna that is composed of one or more turns of wire. An example is the loop antenna used on many table-model radios.

### **antenna, loopstick —** A loop antenna having the conductor wound on a ferrite bar. Used extensively in portable radio receivers because of its small size.

### **antenna, multiband—**An antenna that is designed to operate on more than one band of frequencies.

### **antenna, parabolic —** An antenna consisting of a cylindrical "dish" with an excitable antenna element located perpendicular to the axis of the center of the dish (within the dish).

### **antenna parasitic element—**A passive element not connected to the feed line which reradiates energy from the driven element in



such a manner that it alters the radiation pattern.

**antenna pattern** — The radiation characteristics of a particular antenna. (*Also see antenna radiation pattern.*)

**antenna polarization**—The orientation of the radiating element of an antenna with respect to the earth's surface. The E field determines the polarization of the wavefront and lies parallel to the radiating element.

**antenna power**—That amount of power supplied to the antenna (transmitter power less transmission line losses). Power applied to the antenna terminals.

**antenna power gain** — A ratio of the maximum field radiation from a desired antenna and the maximum field radiation from a reference antenna, when both are driven by the same amount of power. Also equal to the square of the gain in field strength over that of a standard antenna.

**antenna quad**—*See antenna, cubical-quad.*

**antenna, quarter-wave** — An antenna that has an electrical length equal to one-quarter wavelength at the desired operating frequency. The physical length is generally less than the free-

space wavelength.

**antenna radiation pattern**—A graph of the equal power points in the radiated field of an antenna.

**antenna radiator**—The driven element. The element to which the feed line is connected.

**antenna, reference**—May be any type of antenna. Usually a half-wavelength antenna having unity gain. Used for comparison with another type to establish a gain figure.

**antenna reflector**—An element or surface employed in an antenna array for the express purpose of reflecting RF energy and producing a directional characteristic.

**antenna relay** — *See relay, change-over.*

**antenna, resonant-frequency** —The frequency at which an antenna acts as a pure resistance.

**antenna, rhombic**—An arrangement of four long-wire radiators making up the sides of a rhombus. The antenna is fed at one end and is usually terminated by a 600- to 800-ohm resistor at the opposite corner.

**antenna, rotary beam**—A directional antenna that is mounted on a rotatable mast.

- antenna rotator**—*See* rotator, antenna.
- antenna, sense**—An antenna, other than the RDF loop, used to indicate one of the two directions in which the station is located.
- antenna, series-excited vertical**—A vertical antenna that is insulated from ground and fed at the lower end.
- antenna, shunt-excited vertical**—A grounded vertical antenna that is fed at some point above electrical ground.
- antenna, slot**—An antenna that is formed by cutting a slot in a metal surface.
- antenna, square-loop**—An antenna with conductors arranged in the form of a square. The simplest type is a single loop that is series fed on one side.
- antenna, standard**—*See* antenna, reference.
- antenna, Sterba curtain**—An antenna array consisting of a front curtain of several radiators one-half wavelength apart with uniphased currents, and a rear (reflector) curtain directly excited from the transmission lines.
- antenna, stub**—A shorted or open section of transmission line used as an impedance-matching device.
- antenna switch**—A switch used for changing the RF circuit from one antenna to another; a switch used for changing the antenna from one circuit to another, (*Also see* relay, change-over.)
- antenna system**—An antenna assembly consisting of the antenna and the electrical and mechanical devices that insulate, support, and/or rotate it. The antenna circuit in the output of an RF power amplifier or the input of a receiver RF amplifier plus the antenna and associated cabling.
- antenna T match**—A device for feeding a signal to an antenna by grounding the center of the driven element and coupling the signal to both sides of center through two gamma-match sections. A length of transmission line is used as a phasing section between the two feed points when an unbalanced line is employed.
- antenna, top-loaded**—An antenna having a series inductance (loading coil) located at or near the top.
- antenna, trapped dipole**—An antenna that employs parallel-tuned circuits, placed at specific points in the antenna to permit the antenna to work in more than one frequency band. (*Also see* antenna, multiband.)
- antenna, turnstile**—Two half-

wave dipoles at right angles to each other and fed in phase quadrature. Used where a circular radiation pattern is desired.

**antenna, umbrella**—So named because the antenna radiators are guyed downward in all directions from the top of the mast somewhat like a partially opened umbrella.

**antenna, unidirectional**—An antenna having only one well-defined direction of maximum gain.

**antenna, vee**—*See antenna, V.*

**antenna, V (vee)**—An antenna consisting of a V-shaped arrangement of conductors balanced-fed at their apex with their angle, length, and elevation arranged to give the desired directivity.

**antenna, V beam**—*See antenna, V.*

**antenna, vertical**—An antenna positioned perpendicular to the surface of the earth.

**antenna, wave**—A directional antenna composed of parallel-horizontal conductors one-half to several wavelengths long and terminated to ground in its characteristic impedance at the far end. Also called Beverage antenna.

**antenna, whip**—A simple vertical antenna consisting of

a slender whip-like conductor.

**antenna, Yagi**—A type of directional antenna array usually consisting of a driven dipole, reflector, and several directors.

**antenna, zeppelin**—A horizontal antenna that is a multiple of a half wavelength. One end is fed by one lead of a two-wire transmission line that is also a multiple of a half wavelength.

**antinode**—The points of maximum displacement in a series of standing waves. Two similar and equal wave trains traveling at the same velocity in opposite directions along a line resulting in nodes and antinodes along that line. Antinodes are separated from their adjacent nodes by half the wavelength of the wave motions.

**antinode, current**—Any point along a transmission line or antenna at which current is at maximum.

**antinode, voltage**—Any point along a transmission line or antenna at which voltage is at maximum.

**aperiodic antenna**—*See antenna, aperiodic.*

**aperiodic circuit**—A circuit that will not resonate within its normal tuning range, a non-resonant tuned cir-

cuit.

**Applegate diagram**—A graphical representation of electron bunching in a velocity-modulated tube that shows electron positions along the drift space. The bunching is plotted on a vertical axis, and time on the horizontal axis.

**arc**—An electrical discharge between two closely spaced electrodes.

**arc-back**—The discharge that occurs through a gaseous rectifier tube from anode to cathode when the voltage across the tube exceeds the peak-inverse rating of the tube.

**arc-converter**—*See* converter, arc.

**arc lamp**—*See* lamp, arc.

**argon** — An inert gas that gives off a purple glow when ionized; used in rectifier tubes and some lamps.

**armature**—The moving element in an electromechanical device such as the rotating part of a generator or motor. The movable part of a relay, bell, or buzzer.

**Armstrong frequency-modulation circuit**—A phase-shift modulation circuit devised by E. N. Armstrong.

**array**—*See* antenna array.

**arrester, lightning**—*See* lightning arrester.

**A. R. R. L.** — Abbreviation for American Radio Relay

League

**artificial antenna**—*See* antenna, dummy.

**artificial line**—Any lumped-constant network designed to simulate some or all of the characteristics of a transmission line over a desired frequency range.

**artificial load**—*See* dummy load.

**A S A** — Abbreviation for American Standards Association.

**astable multivibrator** — *See* multivibrator, astable.

**astatic microphone**—*See* microphone, astatic.

**"A" supply** — *See* supply, "A".

**atmosphere** — The gaseous mixture that surrounds the earth.

**atmospheric absorption**—*See* absorption, atmospheric.

**atmospheric attenuation** — The loss to a radio wave that occurs as that wave travels through the atmosphere.

**atmospheric diffusion** — The process by which a radio wave is scattered by atmospheric particles.

**atmospheric duct**—A layer of atmosphere that acts similar to a waveguide and conducts radio waves to points far beyond the normal reception area.

**atmospheric interference**—*See* interference, atmospheric.



**atmospheric noise**—*See* interference, atmospheric.

**atmospheric refraction**—The bending of electromagnetic waves as they travel through the atmosphere.

**Atom**—The smallest portion of an element which exhibits all the characteristics of that element.

**ATR tube**—Abbreviation for antitransmit-receive tube. (*Also see* TR tube.)

**attenuation**—*See* specific type.

**audio**—A term used to describe sounds within the range of the human hearing. Also used to describe devices that are designed to operate within this range.

**audio choke**—*See* choke, audio.

**audio compression**—*See* compression, audio.

**audio deviation**—The change in amplitude, frequency, or time a given audio wave undergoes from a normal (reference) value.

**audio expansion**—*See* expansion, audio.

**audio frequency**—That range of frequencies lying within the range of human hearing; approximately 20 to 20,000 cps.

**audio generator**—*See* generator, audio.

**audio oscillator**—*See* oscillator, audio.

**audio-peak limiter**—*See* lim-

iter, audio-peak.

**aural transmitter**—*See* transmitter, aural.

**aurora borealis**—Bands of luminous light appearing in the northern hemisphere. The electrical activity accompanying the aurora borealis creates interference with radio communications.

**Austin transformer**—A transformer used to supply power to the lights on a transmitting tower. A toroid transformer with a conventionally wound primary and secondary composed of a multiple-turn loop with the same diameter as the toroid. The secondary loop and toroid are mechanically linked but spaced away from each other. This arrangement provides maximum inductive coupling between primary and secondary and permits the secondary coil to be connected to an RF radiator.

**auto alarm**—*See* alarm, auto.

**autodyne circuit**—A detector circuit in which the detector is made to oscillate. An example of this circuit is the single transistor used as first detector and oscillator in many transistor receivers.

**automatic frequency control (AFC)**—A circuit that automatically maintains the

frequency of an oscillator within specified limits.

**automatic gain control (AGC)**

—The circuit employed in radio receivers to provide a relatively constant RF signal at the input to the audio detector. A DC reference voltage from the detector output is applied to the RF and IF amplifiers to control the gain of these stages.

**automatic keyer**—*See* keyer, automatic.

**automatic volume compression**

— A method of reducing the amplitude range of an audio signal. Speech and music contain a relatively small amount of high-level signal, and therefore a reduction of background noise can be realized by reducing the amplification of the loudest portions and increasing the low-level signals to bring them above the background noise. The reduction of high passages prevents recording needles from overcutting the record grooves and prevents overmodulation of an RF carrier.

**automatic volume control**

(AVC)—A system that permits the audio-output volume of a receiver to remain relatively constant despite variations in the amplitude of incoming signals. A portion of the re-

ceived signal is generally rectified and filtered to produce the voltage necessary for controlling the gain of two or more stages preceding the demodulator.

**automatic volume control, delayed**

—An AVC circuit that is clamped so that AVC action does not occur until a specific signal level has been reached. This action affords maximum receiver sensitivity during reception of weak signals.

**automatic volume expansion**

—A method of expanding an audio signal that has been previously compressed. *See* automatic volume compression.

**automobile receiver**—*See* receiver, mobile.

**autotransformer**—A transformer that contains a single tapped winding. It is capable of stepping up or stepping down the voltage, but provides no isolation between primary and secondary circuits.

**auxiliary transmitter** — *See* transmitter, auxiliary.

**avalanche conduction** — The conduction of current through a dielectric, insulator, gas, semiconductor, or other material when the breakdown potential is exceeded. Specifically, the conduction through a zener-diode voltage regulator.

**avalanche diode**—*See* zener diode.

**AVC**—Abbreviation. *See* automatic volume control.

**AVE**—Abbreviation. *See* automatic volume expansion.

**average transmitter power output**—That amount of RF power delivered to the output terminals of an amplitude-modulated transmitter averaged over one

modulation cycle.

**average value**—Equal to the sum of all values divided by the number of individual values. For a sine the average value is .637 times the peak value.

**aviation band**—*See* band, aviation.

**AWG**—Abbreviation for American Wire Gauge.

## B

**B**—Designation for plate supply.

**back electromotive force** —  
See electromotive force, back.

**back emf**—Abbreviation for back electromotive force.

**background interference**—See interference, background.

**back-shunt keying**—See keying, back-shunt.

**backward-wave oscillator** —  
See tube, carcinotron.

**Back-wave** — In telegraphic communication, the emission which takes place between the active portions of the code or while no character is being transmitted. Also called spacing wave.

**balanced modulator**—See modulator, balanced.

**ballast tube**—See tube, ballast.

**ballistic galvanometer** — See galvanometer, ballistic.

**balun**—A device for matching an unbalanced coaxial transmission line to a balanced two-wire system.

**balun, linear**—See linear balun.

**band**—Any range of frequencies that lies between two defined limits. See specific type.

**band, amateur** — Any band of frequencies assigned exclusively to radio ama-

teurs. Some of the more popular ones are the 80-, 40-, 20-, 15-, 10-, 6-, and 2-meter bands. There are also numerous other amateur bands which extend up into the EHF range of the frequency spectrum.

**band, aviation**—Any band of frequencies allocated specifically for the aviation services. These frequencies are utilized for aerial navigation as well as radio-communications.

**band, broadcast**—A band of frequencies, extending from 535kc to 1,604 kc, used for the transmission of amplitude-modulated signals intended for reception by the general public. The frequency modulation broadcast band extends from 88 to 108 mc.

**band, Citizens**—Any one of several bands allocated for use by the Citizens Radio Service. Citizens band stations with class-A or -B authorizations operate on specific channels within the 460- to 470-mc UHF band, whereas stations with class-C or -D authorizations operate on specific channels allocated in a band extending from 26.965 to 27.255 mc.

**band, commercial**—Any band



of frequencies used by services engaged in profit making activities. The broadcast bands for example, are commercial radio bands.

**band, communications**—Any band designed to be used for two-way radiocommunications between two or more points as opposed to the broadcast bands where communications is in one direction only.

**band elimination filter**—*See* filter, band-elimination.

**band, EHF**—A band extending from 30,000 to 300,000 mc.

**band, FM broadcast**—A band of frequencies extending from 88 to 108 mc.

**band, government**—Any band allocated for use by governmental agencies, the military, for example.

**band, guard**—*See* guard band.

**band, HF**—A band of frequencies extending from 3 to 30 mc.

**band, industrial**—Any band of frequencies allocated for use by industrial, scientific, or medical (ISM) equipment.

**band, LF**—A band of frequencies extending from 30 to 300 kc.

**band, marine**—Any band of frequencies assigned for use by ships and land-based stations in the mari-

time service. This includes navigation as well as communications.

**bandpass**—The band of frequencies that a circuit or device will pass within specific response limitations. (*Also See* passband.)

**bandpass filter**—*See* filter, bandpass.

**band, public safety**—Any band of frequencies allocated for radiocommunication services essential either to the discharge of non Federal-government functions or the alleviation of an emergency endangering life or property. Common examples are fire and police departments, etc.

**band selector**—A mechanical switching device used in radio transmitters and receivers for selecting the circuit components necessary for operation over a desired band of frequencies.

**band, SHF**—A band of frequencies extending from 3,000 to 30,000 mc.

**bandspread, electrical**—A tuning arrangement used in short-wave receivers whereby a gang of low-value variable capacitors are connected in parallel with the main tuning gang. The main tuning gang is used to tune the desired band, whereas, the bandspread tuning gang makes it pos-

sible to "spread out" the band over a complete rotation of the bandspread dial. This is possible since the smaller capacity of the bandspread tuning gang produces less frequency change per degree of rotation.

**bandspread, mechanical** — A mechanical arrangement whereby a vernier tuning dial is employed to rotate the ganged tuning capacitor much slower than would be possible with the main tuning dial. This makes tuning easier when band conditions are crowded.

**bandspread tuning** — The spreading of tuning indications over a wide range to facilitate separating stations in crowded bands.

**band-stop filter** — *See* filter, band-elimination.

**band, television** — Any band having channels allocated for the transmission or reception of television signals.

**band, UHF** — A band of frequencies extending from 300 to 3,000 mc.

**band, VHF** — A band of frequencies extending from 30 to 300 mc.

**band, VLF** — A band of frequencies extending from 10 to 30 kc.

**bandwidth** — The difference between the upper and low-

er limits of a given band of frequencies; expressed in cycles per second.

**Barium titanate ( $\text{BaTiO}_3$ )** — A manufactured ceramic material used to convert electrical energy into mechanical energy. Barium titanate is used primarily to generate wave energy in liquids and solids. (*Also see* microphone, barium titanate.)

**Barkhausen effect** — *See* oscillation, parasitic.

**Barkhausen-Kurz oscillator** — *See* oscillator, Barkhausen-Kurz.

**barretter** — A metallic resistor with a positive temperature coefficient that is used as the sensing element in certain measuring instruments. Very small diameter wire can be used as a barretter.

**base station** — *See* station, base.

**base, transistor** — *See* transistor base.

**basket winding** — *See* winding, basket.

**battery** — A power source composed of a number of individual chemical cells. An example is the automobile storage battery. (*Also see* cell.)

**battery, A** — Source of filament power for battery-operated tubes.

**battery, AB** — *See* power pack, AB.

**battery, B**—Battery that supplies plate power for battery-operated tubes.

**battery, C**—Source of grid bias for electronic tubes.

**battery eliminator**—A power supply that operates from an AC power source and is used to power battery-operated equipment.

**battery pack**—A number of individual chemical cells that have been combined into one package. Usually a battery that contains both filament and plate supply batteries.

**battery storage**—A group of secondary cells in which the chemical process can be reversed by reversing the current flow through the cells. It can store electrical energy.

**bay**—(1) A recess or cabinet into which electronic equipment is mounted. (2) One section of a multiple-section antenna.

**bazooka**—A type of balun composed of a sleeve over the transmission line to form a quarter-wave section that isolates the end of the coaxial shield from the rest of the transmission line. (*Also see antenna, coaxial.*)

**B battery**—*See battery, B.*

**BC**—Abbreviation for broadcast.

**BCI**—Abbreviation for broad-

cast interference; *See interference, broadcast.*

**BCL**—Abbreviation for broadcast listener.

**beam angle**—*See angle of beam.*

**beam antenna**—*See antenna, beam.*

**beat**—The increase and decrease in amplitude caused by the mixing of two different frequencies. The beat is equal to the difference between the frequencies of the two waves.

**beat frequency**—The note or frequency produced as the result of mixing two different frequencies.

**beat-frequency oscillator (BFO)** — *See oscillator, beat-frequency.*

**beat-frequency receiver** — *See receiver, superheterodyne.*

**beat oscillator**—*See oscillator, beat-frequency.*

**bel**—A unit that represents the ratio of two power levels. The number of bels is equal to the logarithm of  $P_1/P_2$ .

**beverage antenna**—*See antenna, wave.*

**BFO**—Abbreviation for beat-frequency oscillator.

**bias**—The voltage applied to a device to establish an operating characteristic. Usually designates the DC voltage applied to the grid of a vacuum tube or the base of a transistor. (*Also see*

specific type.)

**bias, C**—A term commonly used to designate the bias applied to the grid of a vacuum tube. The term *grid bias* is generally used.

**bias, cathode**—A method for establishing an operating characteristic by employing the voltage drop across the cathode resistor as a bias voltage. The grid is returned to ground through a resistance and the cathode-to-ground potential becomes the operating bias.

**bias, cutoff**—The potential existing between the grid and cathode at which the tube ceases conduction.

**bias, fixed**—Voltage applied to a grid from a stable or fixed voltage source such as a C battery.

**biconical antenna**—*See* antenna, biconical.

**bidirectional microphone** — *See* microphone, bidirectional.

**bilateral antenna**—*See* antenna, bilateral.

**birdies**—Noises and whistles that are generated in a receiver due to strong signals, inadequate shielding, poor alignment, etc.

**bistable multivibrator** — *See* multivibrator, bistable.

**bleeder**—A resistor connected across the output of a power supply. It is used as a safety device to discharge

the filter capacitors when the supply is turned off. It is also used to provide improved voltage regulation by establishing a minimum current drain.

**blocked-grid keying**—*See* keying, blocked-grid.

**blocking oscillator**—*See* oscillator, blocking.

**blooper**—Slang term for a regenerative receiver which radiates an excessive amount of spurious radiations.

**body capacity**—The capacity created by the proximity of a person to an electrical circuit.

**bolometer**—A small resistive element that is used to measure low levels of radiated power. The bolometer element consists of two general types, the barretter and the thermistor.

**bonding**—The method used to to produce good electrical contact between metallic parts of any device. Used extensively in automobiles and aircraft to prevent static buildup. Also refers to the connectors and straps used to bond equipment.

**booster**—A device inserted into a line to increase the voltage. Boosting generators are used to raise the level of a DC line. Transformers are usually employed to boost AC vol-



- tages. The term booster is also applied to antenna preamplifiers.
- bottle**—Term used in amateur radio meaning glass-type vacuum tube.
- breaker**—Common term for a breaking station. Used primarily in amateur radio in reference to an operator desiring to break into an existing conversation between two or more stations.
- breaker, circuit** — *See* circuit breaker.
- break-in keying**—*See* keying, break-in.
- bridge (electrical)** — An arrangement of four elements in a square with an input applied to opposite corners and an output appearing at the adjacent corners. Many variations of the bridge arrangement use resistance, capacitance, inductance, and combinations of each to obtain an unlimited number of bridge types.
- bridge rectifier**—An arrangement of four rectifier units connected at four points in such a manner that an alternating current can be applied at two opposite corners, and a DC output can be obtained from the adjacent corners. Any similar circuit employing a combination of rectifiers and/or capacitors or resistors to rectify an AC signal.
- broadband amplifier**—*See* amplifier, broadband.
- broadband antenna**—*See* antenna, broadband.
- broadcast**—To spread over a wide area. Radio; to radiate an intelligible signal using radio techniques.
- broadcast band** — *See* band, broadcast.
- broadcast interference (BCI)** —*See* interference, broadcast.
- broadside antenna** — *See* antenna, broadside.
- broad tuned** — *See* tuned, broad.
- brush discharge**—*See* corona.
- brute-force filter**—*See* filter, brute-force.
- B supply**—*See* supply, B.
- bug**—*See* key, semiautomatic.
- buncher grid**—*See* grid, buncher.
- bus bar**—A relatively large conductor used to distribute current to a number of circuits. A common wire to which all grounds are returned is termed a ground bus.
- butterfly resonator**—*See* resonator, butterfly.
- BV<sub>cbo</sub> (transistor)** — Symbol for breakdown voltage between the collector and base with the emitter open-circuited.

**BV<sub>ceo</sub> (transistor)**

**BWO**

**backward wave oscillator**

---

**BV<sub>ceo</sub> (transistor)** — Symbol for breakdown voltage between the collector and emitter with the base open-

circuited.  
**BWO (tube) backward wave oscillator** — *See* tube, carcinotron.

## C

**C**—Symbol designation for (1) capacitance, (2) bias supply, (3) centigrade.

**cable, coaxial**—*See* transmission line, coaxial.

**cable, control**—(1) The electrical conductors that are extensions of various controls, permitting operation of the equipment from a remote location. (2) A mechanical linkage between the equipment and control head to permit tuning from a remote point.

**cage antenna**—*See* antenna, cage.

**calibrator, crystal**—*See* crystal, calibrator.

**calling frequency** — *See* frequency, calling.

**call letters**—Identifying characters assigned by the FCC to all licensed radio stations.

**capacitance, interelectrode** — the capacitance existing between any two electrodes within a vacuum tube.

**capacitor** — Two conducting surfaces that are separated by a dielectric material. The capacitance is determined by the area of the surfaces, type of dielectric, and spacing between the conducting surfaces. *Also see* specific type.)

**capacitor bank**—A group of individual capacitors connected together for the pur-

pose of obtaining higher storage capacity or higher operating voltage.

**capacitor-input filter**—*See* filter, capacitor-input.

**capacitor microphone** — *See* microphone, capacitor.

**capacitor, noninductive** — A capacitor that is designed to have a minimum amount of inductive effect on a circuit. Used as efficient RF bypass.

**capacitor, vacuum**—A capacitor (usually variable) built into a glass envelope which has been evacuated of air and gases. The vacuum capacitor affords a very high voltage rating while spacing between plates is kept at a minimum.

**capacity, body**—*See* body capacity.

**carbon microphone**—*See* microphone, carbon.

**carcinotron tube**—*See* tube, carcinotron.

**cardioid microphone**—*See* microphone, cardioid.

**cardioid pattern**—A pattern in the shape of a heart; the reception pattern of a cardioid microphone.

**carrier**—A radio-frequency wave having constant amplitude, frequency, and phase. The RF carrier must be present at the detector of a receiver for the orig-

inal information to be reconstructed.

**carrier amplitude**—The height or magnitude of the carrier signal.

**carrier current**—The current associated with a carrier wave. Also the high-frequency current transmitted over ordinary power lines for communications purposes.

**carrier-current communication** —A method of communication whereby a high-frequency signal is superimposed on ordinary telegraph, telephone, and power-line frequencies for telephone or telegraph communication and control.

**carrier frequency**—The number of cycles per second occurring in a carrier wave.

**carrier frequency, mean**—The average frequency of a transmitter carrier signal. In a frequency-modulation system it would be the resting frequency of the carrier (the frequency when no modulation is present).

**carrier level**—The strength (in decibels) of an unmodulated carrier wave, usually at a specific point within a system.

**carrier modulation, controlled** —*See* modulation, controlled-carrier.

**carrier noise level**—The residual noise level of a carrier

signal when no modulation is present. This type of noise is the result of undesired variations in the RF carrier.

**carrier-operated device, anti-noise (CODAN)**—An electronic circuit that renders a receiver inactive until signals are received.

**carrier-operated squelch** — *See* squelch, carrier-operated.

**carrier power, maximum rated** —The maximum carrier power a transmitter will deliver satisfactorily and safely.

**Carrier shift (asymmetrical modulation)** — The production of positive and negative modulation peaks that are unequal in amplitude due to nonlinear characteristics in the modulated stage.

**carrier suppression**—A method of transmission whereby the carrier wave is not transmitted.

**carrier telegraphy**—*See* carrier-current communication.

**carrier telephone** — *See* carrier-current communication.

**carrier wave**—*See* wave, carrier.

**cascade** — *See* amplifier, cascade.

**cascode** — *See* amplifier, cascode.

**catcher grid**—*See* grid, catcher.



- cathode**—(1) The internal electrode of a device from which the electrons are emitted. (2) The external terminal into which the electrons flow.
- cathode, cold**—A cathode that is designed to supply electrons without the application of heat.
- cathode-coupled multivibrator**—*See* multivibrator, cathode-coupled.
- cathode follower**—*See* amplifier, grounded-plate.
- cathode keying**—*See* keying, cathode.
- cathode modulation**—*See* modulation, cathode.
- cathode ray**—*See* tube, cathode-ray.
- cathode-ray oscilloscope (CRO)**—A device that provides a graphical representation of an electric signal. Term can refer to the tube or to the entire device that incorporates the tube.
- cathode-ray tuning indicator**—*See* tube, electron-ray tuning indicator.
- cathode, thermionic**—The heated surface employed in most vacuum tubes as the electron emitting surface. This cathode is usually a metallic sleeve that is coated with a metallic oxide and heated by a filament.
- cation**—A positive ion that moves toward the cathode in a discharge tube.
- cavity resonator**—*See* resonator, cavity.
- CB**—Abbreviation for Citizens band. *See* band, Citizens.
- C battery**—*See* battery, C.
- C bias**—*See* bias, C.
- cell, alkaline**—A battery that employs an alkali as an electrolyte. The nickle-cadmium cell and the nickle-iron cell are examples of alkaline cells.
- cell, electric**—A device composed of a container, two electrodes, and an electrolyte, that is capable of converting chemical energy into electrical energy, electrical energy into chemical energy, or both.
- cell, Leclanche'**—The common flashlight cell composed of a carbon cathode, a zinc anode, and an ammonium-chloride electrolyte. It employs a manganese-dioxide depolarizer. Also called primary cell.
- cell, light sensitive**—*See* photoelectric cell.
- cell, photoelectric**—*See* photoelectric cell.
- cell, photovoltaic**—*See* photovoltaic cell.
- cell, primary**—An electric cell that is designed to convert chemical energy to electrical energy. The primary cell is not designed to be reactivated.
- cell, secondary**—An electric

cell in which the chemical reaction is reversible. The chemicals can be restored to their original form by reversing the current flow through the cell.

**cell, standard** — An electric cell that is used as a source of constant voltage and as a reference for establishment of a standard volt.

**cell, voltaic**—An electric cell that produces a voltage as the result of chemical action on two dissimilar metals.

**center frequency** — *See* frequency, center.

**center-loaded antenna** — *See* antenna, center-loaded.

**center-tap keying** — *See* keying, center-tap.

**centigrade, temperature** — A temperature scale employed in most scientific work. The scale is divided into 100 divisions between the freezing and the boiling points of water. Zero degrees is equal to 32° on the Fahrenheit scale, and equal to 273.16° on the Kelvin scale.

**ceramic microphone**—*See* microphone, ceramic.

**change-over relay**—*See* relay, change-over.

**change-over switch** — *See* relay, change-over.

**changer, frequency** — *See* frequency changer.

**channel**—A subdivision of a band to which the emission of a transmission is con-

fined.

**characteristic impedance**—In a delay line, the terminating resistance that affords minimum resistance to the input and output of the network. Also, the driving-point impedance of a line assumed to be of infinite length. Also called surge impedance.

**charger, battery**—*See* battery charger.

**chassis**—A metal structure used as a support for mounting the components of an electronic circuit or device. In most instances the conductive properties of the chassis itself are utilized as part of the circuitry.

**choke**—An inductance used to impede any change in the flow of electrical current. The opposition it offers varies with the frequency of the current it is designed to control. (*Also see* specific type.)

**choke, audio**—An iron-core inductance designed to impede the flow of audio-frequency currents.

**choke, filter**—An iron-core inductance which opposes any change in the flow of alternating current. Used primarily in power supplies and other circuits where filtering of AC ripple components or pulsating DC is required.

**choke input** — *See* filter, choke-input.

**choke-input filter**—*See* filter, choke-input.

**choke, parasitic**—A combined inductance-resistance device that is generally connected in series with the grid and/or plate circuit of a stage to suppress parasitic oscillations. Also called parasitic suppressor.

**choke, RF**—A coil, usually wound in two or more sections, used to prevent RF currents in one circuit from feeding into another.

**choke, smoothing**—An iron-core choke coil designed to impede current fluctuations. The most common use of this choke is in the filter section of DC power supply circuits.

**choke, swinging**—An iron-core choke coil designed in such a way that its effective inductance changes inversely with the amount of current drawn through it. Used primarily as the input inductance in choke-input filter circuits.

**chopper**—A mechanical or electrical device used to change a constant level or very low-frequency signal into a higher-frequency signal. The higher frequency avoids the problems inherent in DC and very low-frequency amplifier sys-

tems.

**circuit, absorption** — *See* absorption circuit.

**circuit breaker**—A switch inserted into a line and operated either manually or automatically. Usually a safety device that opens the circuit when the current or voltage deviates greatly from an established value.

**circuit, de-emphasis**—*See* de-emphasis network.

**circuit, differentiating**—*See* network, differentiating.

**circuit, printed** — *See* printed circuit.

**circuit, tank**—An inductance-capacitance circuit capable of storing electrical energy over a band of frequencies continuously distributed about a single frequency at which the circuit is resonant. A parallel resonant circuit comprising an inductance and capacitance connected in the input and/or output circuit of a tuned stage.

**circularly-polarized wave** — *See* wave, circularly polarized.

**Citizens band**—*See* band, Citizens.

**clammer**—A form of DC restorer. A circuit which adds a fixed bias to a stage or component to hold the voltage or current (clamp it to) a specific level. In a radio transmitter the clamper

circuit provides a fixed bias to the final RF amplifier to protect the tube from damage by excessive plate current should there be a loss of excitation, or drive.

**Clapp, oscillator** — *See* oscillator, Clapp.

**class, amplifier** — *See* specific type.

**class-A amplifier**—An amplifier stage designed in such a way that plate current flows at all times during the AC cycle applied at the grid. The tube of a class-A amplifier operates on the linear portion of the  $E_g$ - $I_p$  characteristic curve and is often referred to as a linear amplifier.

**class-AB amplifier** — An amplifier in which the grid bias and AC grid voltage are such that plate current is permitted to flow for more than half but less than the complete AC cycle applied to the grid.

**class-AB<sub>1</sub> amplifier**—A modified form of the class-AB amplifier in which the grid is never driven positive with respect to the cathode. No driving power is required in this class of operation; only voltage is needed.

**class-AB<sub>2</sub> amplifier**—A modified form of the class-AB amplifier in which grid current flows during that por-

tion of the cycle when the grid input signal is large. Class-AB<sub>2</sub> operation requires driving power rather than voltage.

**class-B amplifier**—An amplifier that operates with the grid biased at approximately the cutoff value. Plate current is essentially zero until a signal is applied at the grid, at which time plate current flows during approximately one-half of the input cycle.

**class-C amplifier**—An amplifier that is biased somewhat beyond the cutoff point, so that plate current flow is zero when no AC signal is applied to the grid. When a signal is present, plate current flows during somewhat less than half of the AC input cycle.

**click filter**—*See* filter, key-click.

**click(s), key** — *See* key click(s).

**clipper**—A circuit that limits the amplitude of signals or noise pulses by clipping all peaks above a predetermined level. In some radio transmitters a speech clipper circuit is employed to prevent high audio peaks from causing overmodulation.

**cloverleaf antenna**—*See* antenna, cloverleaf.

**coax**—Abbreviation for co-



axial.

**coaxial antenna**—*See* antenna, coaxial.

**coaxial cable**—*See* transmission line, coaxial.

**CODAN** — Abbreviation. *See* carrier-operated device, anti-noise.

**co-channel interference** — Interference between two signals being transmitted in the same radio channel.

**code**—(1) A set of signals that represent letters and numerals and are used to convey messages. (2) A set of rules. (*Also see* Morse code and National Electrical Code.)

**code, color**—A coding system that represents numerals, percentages, and voltages by a special arrangement of colors. The color is applied as dots or bands on the item or by coloring part or all of the item.

**code character** — A specific grouping of code elements used to represent a particular letter or number.

**code element**—One recognizable feature of a code, such as the existence of a pulse or a space, or the duration of the pulse or space.

**code recorder**—A device that makes permanent records of code messages.

**coefficient**—A figure or constant that is applied to a particular item and is used

to calculate the change under a given set of conditions.

**coefficient of coupling** — *See* coupling, coefficient of.

**coherent oscillator**—*See* oscillator, coherent.

**coherent radiation** — Radiation that has a definite phase relation throughout the beam. The carrier signal broadcast by a radio transmitter is coherent radiation.

**coil**—One or more turns of electrical conductor forming a circuit element, such as a choke coil, peaking coil, etc. (*Also see* specific type.)

**coil, antenna loading**—An inductance connected in series with an antenna to cancel capacitive characteristics and thus make the antenna more closely represent a resistive load to the transmitter output circuit.

**cold cathode** — *See* cathode, cold.

**collinear antenna**—*See* antenna, collinear.

**collector**—(1) The terminal to which most of the injected carriers flow in a transistor. (2) The terminal in a vacuum tube that collects the electrons after completion of their work function.

**color code**—*See* code, color.

**Colpitts oscillator**—*See* oscillator, Colpitts.

**commercial band**—*See* band,

commercial.  
**common base**—*See* amplifier, common-base.  
**common collector** — *See* amplifier, common-collector.  
**common emitter**—*See* amplifier, common-emitter.  
**common terminal**—*See* terminal, common.  
**communications band** — *See* band, communications.  
**communications receiver** — *See* receiver, communications.  
**commutator** — Any device used to switch the connections to an electrical circuit in synchronism with some desired effect. The commutator bars on a motor armature synchronize the switching to the armature rotation.  
**compandor**—A system for compressing speech during transmission or recording and of expanding it again at the reproducer.  
**compensation**—(1) An adjustment made to a circuit to avoid undesirable effects in the output signal. (2) An adjustment made during a measurement to compensate for known errors.  
**complementary transistor types**—*See* transistor types, complementary.  
**compression, audio**—A method for reducing the amplitude range of an audio signal. The reduction in

signal amplification is in direct proportion to the average amplitude of the original signal. (*Also see* compression, signal.)  
**compression, signal**—A method for reducing the amplitude range of a signal to prevent overmodulation of a carrier or to prevent a recording needle from cutting into an adjacent groove. In this process the low-level signal is nearly normal, but as the signal amplitude rises, the amplification is reduced. This results in a signal with a reduced amplitude range but containing all of the amplitude information. Full recovery of the amplitude range can be realized by reversing the process with a volume expander.  
**concentric line** — *See* cable, coaxial.  
**concentric-line oscillator**—*See* oscillator, concentric-line.  
**condenser**—*See* capacitor.  
**condenser microphone** — *See* microphone, capacitor.  
**condenser speaker** — *See* speaker, capacitor.  
**conduit (electrical)**—A type of metal pipe or tubing through which electrical conductors are run.  
**conduction (electric)** — The movement of electrons through a conducting medium. *See* specific type.

**conduction, gaseous**—*See* gaseous conduction.

**conduction, thermal** — *See* thermal, conduction.

**CONELRAD** — Abbreviation for CONTROL of ELECTRO-magnetic RADiation.

**cone of silence**—The area directly above the antenna of a radio beacon station in which no signal is received.

**conical antenna** — *See* antenna, biconical.

**connector** — Any device that is used to couple, or join, two or more parts.

**CONS** — Abbreviation for Carrier Operated Noise Suppression. *See* squelch, carrier-operated.

**console**—Generally a rather large metal cabinet that houses the operating controls, microphone, preamplifiers, etc. for a radio transmitter. A remote-control unit usually designed to fit into desk facilities.

**constant-current modulation** — *See* modulation, constant-current.

**constant propagation** — *See* propagation, constant.

**constant, RC**—The time required for a capacitor to charge or discharge through a resistor. The time required to reduce the charge by 63% of its original value, or that required to increase the charge to 63% of the full charge (*Also see*

time constant.)

**constant, RL**—The time required for the current through a series resistance and inductance to attain 63% of the final value. The time is equal to the inductance in henrys divided by the resistance in ohms. (*Also see* time constant.)

**contact microphone**—*See* microphone, contact.

**contact potential**—*See* voltage, contact.

**continental code** — *See* Morse code.

**continuous spectrum** — *See* spectrum, continuous.

**continuous wave (CW)**—*See* wave, continuous.

**continuously loaded antenna**—An antenna having a loading coil that is helically wound along the entire length of the antenna. The winding may either be in steps or evenly spaced.

**control cable**—*See* cable, control.

**control electrode**—A conductor placed in a position where charges impressed on it will affect the current between other electrodes.

**control grid**—*See* grid, control.

**control room** — The room from which radio or other electronic equipment is controlled. Usually the remote-control point in a two-way

radio system. The radio equipment itself may or may not be located in the same room.

**conversion transconductance**—*See* transconductance, conversion.

**converter (AC to DC)** — A mechanical or electronic device designed to change alternating current into direct current. The mechanical device is generally a rotary-type converter. *See* specific type.

**converter, arc**—A device that utilizes an electric arc and a tank circuit to produce RF oscillations.

**converter, frequency** — Any mechanical or electronic device capable of changing the frequency of an alternating current.

**converter noise**—Noise produced in the mixer stage of a superheterodyne receiver or a converter during the frequency-conversion process.

**converter, pentagrid** — *See* tube, pentagrid converter.

**copper-oxide rectifier** — *See* rectifier, copper-oxide.

**corner reflector**—*See* antenna, corner-reflector.

**corona** — The ionization of gases about a conductor that results when the potential gradient reaches a certain value. Also called brush discharge.

**corona ring**—A metallic ring placed around and connected to a conductor carrying a high voltage. The ring increases the surface area of the conductor and results in a decreased potential gradient and reduction of the corona discharge.

**counter emf**—*See* electromotive force, back.

**counterpoise, antenna**—A net of radial conductors extending from the base of an antenna. The radials are elevated above ground and are insulated from each other and from ground.

**coupler, antenna**—*See* antenna, coupler.

**coupler, directional**—*See* directional coupler.

**coupling, coefficient of**—The degree to which two inductances are coupled. Designated as  $k$  and equal to  $M/\sqrt{L_1 L_2}$ .

**coupling, critical** — That amount of coupling between primary and secondary turns of a tuned transformer which provides maximum secondary current. The point of critical coupling also provides a relatively flat-topped response curve.

**coupling, direct**—A method of coupling between stages of amplification in which the DC level is transferred.

This causes a stair stepping of the reference level. Direct coupling is used where very low frequencies and DC reference signals must be amplified.

**coupling, link**—A method of mutually coupling two coils that cannot be connected together physically. A link between the two coils established by placing a winding around each coil and then connecting these windings to each other.

**cps**—Abbreviation for cycles per second.

**critical angle (antenna)**—*See* angle, critical.

**critical coupling**—*See* coupling, critical.

**critical damping**—*See* damping, critical.

**critical frequency**—*See* frequency, penetration.

**critical grid voltage**—That voltage applied to the grid of a gas tube at which conduction between the cathode and anode is initiated.

**CRO** — Abbreviation. — *See* cathode-ray oscilloscope.

**cross-band operation**—A system of operation where the transmitting station transmits frequencies in one band but receives replies on frequencies in a different band.

**cross-channel operation** — A common type of two-way operation where stations

transmit on one channel and receive replies on another channel within the same band. This should not be confused with cross-band operation.

**cross modulation** — A type of intermodulation interference caused when the carrier of the desired station is modulated by an undesired signal.

**cross neutralization**—A method of neutralization employed in push-pull stages whereby a portion of the plate-cathode AC voltage of one tube is applied through a neutralizing capacitor to the plate-cathode circuit of the other tube.

**cross talk**—A type of interference caused by audio frequencies from one line feeding signals into adjacent lines. Also the term used to describe cross modulation, or intermodulation, where the carrier of the desired station is modulated by an undesired signal.

**CRT**—Abbreviation for cathode-ray tube. *See* tube, cathode-ray.

**crystal**—A piece of natural quartz, rochelle salt, or other piezoelectric material that will generate a voltage when subjected to a physical strain or a physical motion when a voltage is applied. Crystals find com-



- mon usage as the frequency-determining element in transmitter and receiver oscillator circuits. The frequency at which a crystal will oscillate is determined primarily by its physical dimensions. Also called rock.
- crystal activity**—The magnitude at which a crystal vibrates. A crystal of low activity is one that produces weak output.
- crystal calibrator**—A crystal-controlled oscillator that produces a reference signal used to check or set the frequency tuning of a receiver or transmitter.
- crystal-controlled oscillator** —  
*See* oscillator, crystal-controlled.
- crystal-controlled transmitter**  
—*See* transmitter, crystal-controlled.
- crystal cut** — The plane at which a crystal slab is cut from its natural state, such as the AT, BT, CT, GT, V, X, Y, and Z cuts.
- crystal detector**—A type of detector that employs a galena crystal or other material that exhibits rectifying qualities and a small wire that is adjusted to a sensitive spot on the crystal. Used in the early days of radio. It is still used, but now it employs the point contact or junction diode and is called diode detector.
- crystal diode**—A point-contact diode. A crystal of semiconducting material with a fine wire adjusted to a highly sensitive spot and enclosed in a protective case.
- crystal filter**—*See* filter, crystal.
- crystal frequency**—The frequency at which a crystal vibrates. In special cases a crystal may be made to vibrate at more than one frequency. In such cases the crystal frequency is considered to be the fundamental mode.
- crystal, galena**—A crystalline form of lead sulphide often used as a crystal detector for radio signals.
- crystal microphone**—*See* microphone, crystal.
- crystal mixer**—A device into which the incoming signal and the local oscillator frequency are fed to form the heterodyne signal. The crystal mixer is employed at frequencies of about 1,000 mc and higher because of the decrease in transit time and noise effects.
- crystal oscillator**—*See* oscillator, crystal-controlled.
- crystal oven**—A temperature-controlled enclosure devised to maintain the crystal at a constant temperature and thus maintain a

high degree of frequency stability.

**crystal, overtone**—A crystal that will oscillate at harmonics of the frequency for which it is actually ground. Overtone crystals are specially designed to operate at overtone frequencies.

**crystal, quartz**—A form of silicon dioxide with a melting point of about 1,600° C. When special types of quartz are cut into flat slabs they can be used as frequency-control devices. Controlling the thickness of the cut controls the fundamental frequency at which they will oscillate.

**crystal rectifier**—*See* rectifier, crystal.

**crystal, rochelle salt**—A crystalline compound that exhibits the ability to convert electrical energy to mechanical energy and vice versa. Used in phonograph pickups, microphones, and speakers.

**crystal speaker**—*See* speaker, crystal.

**C supply**—*See* supply, C

**cubical-quad antenna** — *See* antenna, cubical-quad.

**current, alternating**—An electrical current that alternately reverses its direction of flow. The rate at which these alternations occur in a given unit of time (generally seconds) is given as

the frequency of the current.

**current, antinode**—*See* antinode current.

**current, direct** — Electrical current that flows in one direction only. It may be constant or pulsating as long as its movement is in the same direction.

**current, eddy**—Electric current induced in a conducting substance by a changing magnetic field.

**current, exciting**—*See* exciting current.

**current feed**—A method of exciting a transmitting antenna by feeding RF current at the point of minimum impedance.

**current, induced**—The current that flows in a conductor subjected to a magnetic field of varying intensity. In an antenna it is that current produced by an electromagnetic field.

**current, ionization**—*See* ionization current.

**current loss, eddy**—Energy losses due to heat generated by eddy currents. (*Also see* induction heating.)

**current node**—*See* node, current.

**cutoff bias**—*See* bias, cutoff.

**cutoff frequency**—*See* frequency, cutoff.

**CW**—Abbreviation for continuous wave. *See* wave,

**cycle**

continuous.  
**cycle**—The change of an alternating wave from zero to a positive peak and back to zero, and then to a peak and back to zero in the negative direction. The

**cylindrical antenna**

number of cycles which occur in one second is given as the frequency of the wave.

**cylindrical antenna**—See antenna, coaxial.

## D

**damped wave** — *See* wave, damped.

**damping**—Reduction of energy in an electrical or mechanical system. In an oscillatory system the act of progressively reducing the amplitude of an oscillation or the hindrance or prevention of oscillations.

**damping, critical** — The degree of damping which provides the fastest transient response without overshoot.

**daraf**—The unit of elastance. Equal to the reciprocal of capacitance. (Actually farad spelled backwards.)

**db** — Abbreviation. *See* decibel.

**dbm**—Abbreviation for decibels rated above or below 1 milliwatt. Reference level 0.001 watt.

**db meter**—*See* meter, db.

**DC** — Abbreviation. *See* current, direct.

**DC component**—The average value of a signal. Also the DC portion of any pulsating current.

**DC generator**—*See* generator, DC.

**DC restorer**—*See* clamper.

**dead spot** — An area where reception of certain signals is unusually poor or impossible.

**decade box**—An assembly of precision resistors, capaci-

tors, or coils arranged in two or more sections, each having ten times the value of the preceding section. Each section in turn is divided into ten equal parts and a ten-position selector switch or similar arrangement for each section permits the box to be set to any value within its range.

**decibel (db)**—A unit for expressing a power ratio that is equal to 10 times the common logarithm of the power ratio. One decibel is the amount by which the pressure of a pure sine wave of sound must be varied in order for the change to be detected by the average human ear. The decibel can express an actual level only when compared with some definite reference level that is assumed to be zero db.

**decoupling**—Preventing the transfer of a signal, a voltage, or a current from one point in a circuit to another.

**decoupling filter**—*See* filter, decoupling.

**de-emphasis network** — *See* network, de-emphasis.

**delay line**—An artificial or real transmission line or equivalent device designed to delay a wave or signal for a specific length of

time.

**delayed AVC**—*See* automatic volume control, delayed.

**delay fuse**—*See* fuse, delay.

**demodulation**—A method of recovering the original information from a modulated waveform.

**demodulation envelope** — A graphic representation of the filtered output of a demodulator showing the rectified peaks of the modulated carrier. Can be observed by connecting an oscilloscope to the output of an AM detector.

**demodulator**—Any of a number of devices employed to recover the intelligence impressed on a waveform. (*Also see* specific type.)

**demodulator, square-law** — A detector whose output is proportional to the square of the amplitude of the input signal. Not satisfactory for detection of modulated waves because of the distortion that is introduced.

**demodulator, synchronous**— A detector that employs a switching arrangement that is synchronized to the information contained in a modulated wave. Useful for demodulating a wave that has been modulated by more than one signal.

**detection**—(1) Method of demodulation. (2) A method of indicating the presence

of a radiation, signal, electrical variation, etc.

**detection, grid-leak**—A method of detection in which the grid of a vacuum tube is used as the anode of a diode, and current developed across the grid leak biases the tube. The audio variations developed across the grid leak are amplified in the tube plate circuit.

**detection, linear**—The reproduction of the modulation existing on a waveform in its exact form. Any non-linearity will produce distortion in the reproduced signal.

**detection, plate** — A method of demodulation in which a tube is biased to cutoff, causing only one half of the modulation envelope to be amplified. The audio intelligence is produced in the plate circuit by filtering out the RF component.

**detector**—(1) A device used to recover the intelligence from a modulated wave. (2) A device used to indicate the presence of a radiation, signal, electrical variation, etc.

**detector, crystal**—*See* crystal detector.

**detector, heterodyne**—A circuit or device used to produce an intermediate frequency. Often referred to as frequency converter or



mixer.

**detector, phase**—A circuit that compares the phase of two signals of the same frequency.

**detector, product**—A detector whose output is the product of two input signals. Particularly useful for demodulation of DSB and SSB where the sideband signal and the local signal, representing the carrier frequency, are fed to the detector. The detector output will be proportional to the modulation on the received signal.

**detector, ratio**—A variation of the phase-shift discriminator in which the circuit responds to frequency modulation but is not responsive to amplitude modulation.

**detector, regenerative** — A grid-leak detector that has signal feedback from plate to grid and is adjusted to the critical point; that is, the point just before oscillation occurs.

**detector, superregenerative**—A regenerative detector that is adjusted to produce self-quenching oscillations. The output of this detector is proportional to the logarithm of the input signal and results in a distortion of the original signal.

**detector, synchronous** — *See*

demodulation, synchronous.

**detune**—Any change in the inductance and/or capacitance of a tuned circuit that causes the circuit to operate at a frequency other than the desired frequency.

**deviation, frequency** — *See* frequency deviation.

**deviation, phase**—*See* phase deviation.

**deviation ratio**—The ratio of maximum deviation of an FM carrier to the highest audio frequency contained in the modulating signal.

**diamond antenna** — *See* antenna, rhombic.

**dielectric** — An insulating (nonconducting) medium. A material used between the plates of a capacitor. Common examples of dielectrics are mica, ceramic, plastic, air, etc.

**dielectric absorption**—Also called dielectric soak and dielectric hysteresis. A characteristic of dielectrics that determines the amount of time it takes a capacitor to deliver the total amount of its stored energy. (*Also see* electret.)

**dielectric breakdown** — Any change in the properties of a dielectric that cause it to become conductive.

**dielectric loss** — The power dissipated in a dielectric as the result of the friction produced by molecular mo-

tion when an alternating electric field is applied.

**dielectric heating**—A method of heating an insulating medium by placing it in an RF field. Heating of dielectrics in this manner is employed in many industrial processes.

**differentiating circuit** — *See* network, differentiating.

**diode**—A device containing an anode and cathode that will conduct current more readily in one direction than in the other. The diode may be a vacuum tube or a solid-state semiconductor such as germanium, selenium, silicon, etc.

**diode, crystal**—*See* crystal diode.

**diode, germanium**—A two-electrode device using germanium as the semiconducting material.

**diode, silicon**—A two-terminal, solid-state device using silicon as the semiconducting material. Used primarily as rectifiers in power-supply circuits.

**dipole**—*See* antenna, dipole.

**dipole, folded**—*See* antenna, folded-dipole.

**direct coupling**—*See* coupling, direct.

**directional coupler**—A coupling device that is inserted into a transmission line and has two outputs; one is proportional to the power mov-

ing toward the antenna, and the other is proportional to the returning, or reflected, power. The coupler may be used to check power output and standing-wave ratio.

**direct current**—*See* current, direct.

**direct wave**—*See* wave, direct.

**directional antenna**—*See* antenna, directional.

**direction finder, Adcock** — A radio direction-finder system that uses one or more pairs of Adcock antennas. (*Also see* direction finder, radio.)

**directional microphone**—*See* microphone, directional.

**direction finder, radio**—A radio device designed to indicate the direction in which a radio transmitter is located.

**direction of polarization** — The direction of the lines of force in the electric field of a radiated wave. (*Also see* polarization.)

**directivity, antenna**—That characteristic of an antenna that permits it to radiate or receive more signal energy in one direction than in another.

**directivity pattern**—A pattern derived from field-strength measurements around an antenna that will show its directional characteristics.

**director, antenna**—*See* antenna director.

**direct wave**—*See* wave, direct.

**discharge tube**—*See* tube, discharge.

**discone antenna**—*See* antenna, discone.

**discriminator, FM**—A circuit that is designed to change a frequency-modulated wave into an amplitude-modulated wave.

**discriminator, phase-shift**—A circuit that uses the phase shift in a tuned circuit to provide an amplitude change that is proportional to the frequency change. An FM detector.

**dissipation, energy**—*See* energy dissipation.

**distortion, amplitude**—Distortion produced by nonlinear amplification in a tube or transistor stage. Amplification on the nonlinear portion of a characteristic wave will produce amplitude distortion.

**distortion, frequency**—Distortion caused by an amplifier that fails to amplify all frequencies within a given range, equally. Most amplifiers are limited as to the range of frequencies that can be amplified equally.

**distortion, harmonic** — *See* harmonic distortion.

**distortion, intermodulation** —

The modulation of one frequency by another when more than one frequency is amplified in a nonlinear amplifier. Since all amplifiers are nonlinear to some degree, a certain amount of intermodulation distortion takes place when complex waveforms are amplified.

**distortion, phase** — Distortion caused by the difference in time delay of different frequencies during passage through a network. The time delay must be identical at all frequencies if phase distortion is to be avoided.

**distortion, signal**—An undesirable change in a signal waveform. Note: a change introduced to achieve a specific purpose cannot be considered distortion.

**distress frequency** — *See* frequency, distress.

**distributor-noise suppressor** —*See* suppressor, distributor-noise.

**divergent wave(s)** — *See* wave(s), divergent.

**diversity, frequency**—The use of two or more frequencies to transmit the same information. The fact that different frequencies do not fade at the same times makes it possible to have uninterrupted communications.

**diversity receiver** — *See* re-

ceiver, diversity.

**diversity reception**—A method of reception designed to minimize fading. With this type of reception, two or more sources of received-signal energy that carry the same intelligence but differ in signal-to-noise ratio or signal strength are combined or selected.

**diversity, space**—The use of two or more antennas that are separated in space to take advantage of the fact that signals arriving at two different locations do not fade at the same time.

**divider, frequency**—*See* frequency divider.

**dog house** — A slang term given the small building structure containing the antenna-tuning and pattern-directivity equipment of most broadcasting stations. The dog house is generally located at the base of the antenna structure.

**Doherty amplifier** — *See* amplifier, Doherty.

**doorknob tube** — *See* tube, doorknob.

**Doppler effect** — The change in frequency observed when the relative velocity between the signal source and observer is changed. An example is the apparent change in pitch of a train whistle as the train moves toward and past a specific

point.

**Doppler shift** — The change observed in the frequency of a wave due to the Doppler effect.

**double-conversion superheterodyne**—*See* superheterodyne, dual-conversion.

**double-ended stage** — *See* push-pull circuit.

**double modulation**—*See* modulation, double.

**double-sideband modulation** —*See* modulation, double-sideband.

**double-sideband transmission** —A method of radiocommunications whereby both sidebands are transmitted. The carrier may or may not be transmitted with the sidebands, or it may be transmitted at a reduced level.

**double-spot tuning** — A condition in superheterodyne reception where the same station can be received at two different spots on the dial. The station position is determined by the frequency of the local oscillator and whether it is above or below the oscillator frequency.

**doublet antenna**—*See* antenna, doublet.

**down lead**—*See* lead in.

**downward modulation** — *See* modulation, downward.

**DPDT (switch)** — Abbreviation for double-pole double-

throw switch.

**DPST (switch)** — Abbreviation for double-pole single-throw switch.

**dress, lead**—*See* lead dress.

**drift** — The change in the characteristic of a device, wave, signal, etc., such as the drift in oscillator frequency during tube warm-up.

**drift frequency**—*See* frequency, drift.

**drive, grid**—*See* grid drive.

**driven element, antenna** — *See* antenna driven element.

**driver**—The stage preceding the final, or power, stage.

**driving signal** — *See* signal, driving.

**drop-out current, relay** — *See* relay drop-out current.

**dry cell**—An electrochemical cell that uses a paste electrolyte as compared to the wet cell that uses a liquid for an electrolyte.

**DSB**—Abbreviation for double sideband. *See* modulation, double-sideband.

**dual-conversion superheterodyne** — *See* superheterodyne, dual-conversion.

**duct (electrical)**—A channel or conduit used for wire runs. (*Also see* atmospheric duct.)

**dummy antenna** — *See* antenna, dummy.

**dummy load**—A device used during transmitter tests and adjustments to simu-

late a real antenna. It has the necessary power dissipation capabilities and exhibits the same impedance characteristics as the antenna; however, unlike the latter it radiates essentially no RF energy.

**duplexer**—A circuit that permits the same antenna to be used for both transmission and reception of radio signals. It prevents excessive amounts of transmitter power from flowing into the receiver circuits, and at the same time it affords minimum reduction of the receiver input signals.

**duplex operation** — A method of radiocommunications whereby signals can be transmitted and received simultaneously.

**duty cycle**—The amount of time a device operates as opposed to its idle, or standby, time.

**DX**—A communications term meaning distance.

**dynamic microphone** — *See* microphone, dynamic.

**dynamic speaker**—*See* speaker, dynamic.

**dynamo**—A device that employs the principles of magnetic induction to transform mechanical energy into electrical energy, and vice versa.

**dynamotor (DC to DC)**—A motor-generator device in



which the low-voltage and high-voltage windings are common to the same armature. Used to generate plate voltage for radio equipment using a storage battery as the power source.

**dynatron**—The operation of a screen-grid tube to produce a negative-resistance

region in the plate characteristic curve. When the screen grid of a tetrode or pentode is operated at a higher voltage than the plate, a negative plate characteristic is produced.

**dynatron oscillator** — *See* oscillator, dynatron.

## E

**E**—Symbol used to denote (1) electromotive force, (2) voltage, (3) electric-field strength, (4) transistor emitter, and (5) ionized layer of atmosphere.

**earphone** — *See* headphone.

**earth** — British terminology for zero reference level. (*Also see* ground.)

**Eccles-Jordan circuit** — *See* multivibrator, bistable.

**ECO** — Abbreviation for electron-coupled oscillator. *See* oscillator, electron-coupled.

**eddy current** — *See* current, eddy.

**eddy-current loss** — *See* current loss, eddy.

**effective height of antenna**—The center of radiation of an antenna as used as a reference point to determine the height above effective ground level.

**effective radiated power** — Computed as the product of the power delivered to the antenna and the power gain of the antenna. Antenna power  $\times$  antenna power gain. *See* antenna power gain.

**egg (insulator)**—A ceramic insulator that is shaped like an egg and designed as a compression-strain type of insulator. The two lines are looped through the insulator so that if the in-

ulator breaks, the two loops will catch and prevent mechanical separation of the line.

**EHF** — Abbreviation for extremely high frequency. *See* band, EHF.

**eight ball**—*See* microphone, eight-ball.

**E-layer**—A layer of ionized air in the E region of the atmosphere. Approximately 60 to 90 miles above the earth's surface.

**E-layer, sporadic**—An area of ionization that occurs in the E region of the atmosphere. However, since the ionization level of this layer rises and falls, it is termed sporadic.

**electret**—A dielectric that has permanently charged poles. Analogous to a magnet except the poles have positive and negative electric charges.

**electrical bandspread** — *See* bandspread, electrical.

**electrical bridge**—*See* bridge, electrical.

**electrical code**—*See* National Electrical Code.

**electrical interference** — *See* interference, electrical.

**electric-eye**—Colloquial for a photoelectric cell or an electron-ray tuning indicator.

**electric field**—*See* field, elec-

tric.

**electric lines of force**—A representation of the path along which a charge would move if introduced into an electric field. Lines of electric force exist between any points that exhibit a difference in potential.

**electrode** — Any conductor that is used to transfer an electric charge or current from one conducting medium to another. Examples are lightning rods, metallic elements in vacuum or gas tubes, terminals submerged in plating tanks, etc.

**electrolysis**—The decomposition of a compound into ions by the passage of electric current through the substance.

**electrolyte** — All substances that form a conducting solution when dissolved in a solvent of high dielectric strength. Acids, bases, and salts are the three divisions of electrolytic substances.

**electromagnet** — A device composed of a coil of wire and an iron core that becomes a magnet only when current is passing through the coil.

**electromagnetic field** — *See* field, electromagnetic.

**electromagnetic radiation** — *See* radiation, electromagnetic.

**electromagnetic speaker**—*See*

speaker, electromagnetic.

**electromagnetic wave(s)**—*See* wave(s), electromagnetic.

**electromechanical** — Any device that is both electrical and mechanical in nature. One example would be dynamotor.

**electromechanical transducer**—A device capable of changing electrical energy into mechanical energy (e.g., a speaker) or mechanical energy into electrical energy (e.g., a microphone).

**electromotive force (emf)** — The force or pressure that causes electron flow between two points. The common unit of electromotive force is the *volt*.

**electromotive force, back**—A voltage developed in an inductive circuit by an alternating current. The polarity of this voltage is such that it opposes the change in current that produces it. Also called counter electromotive force.

**electron, avalanche**—*See* avalanche conduction.

**electron-coupled oscillator** — *See* oscillator, electron-coupled.

**electron emission**—*See* emission, electron.

**electron-multiplier tube**—*See* tube, electron-multiplier.

**electron-ray tuning indicator** — *See* tube, electron-ray tuning indicator.

**electron tube** — *See* tube, electron.

**electron volt**—A measure of the energy or velocity gained by an electron falling through an electric field produced by one volt.

**electronic keyer**—*See* keyer electronic.

**electro-optical** — A term applied to a group of devices that employ a combination of electrical and optical principles to control light radiation. One such device is the Kerr cell.

**electrostatic** — Pertaining to static electricity, or electricity at rest. An electric charge, for example.

**electrostatic field**—*See* field, electrostatic.

**electrostatic microphone**—*See* microphone, capacitor.

**electrostatic shield**—A shield that prevents undesirable electrostatic coupling between stages but at the same time permits electromagnetic coupling.

**element** — *See* specific type; i.e., antenna, tube, etc.

**eliminator, battery**—*See* battery eliminator.

**E lines**—*See* electric lines of force.

**emergency frequency** — *See* frequency, emergency.

**emf**—Abbreviation. *See* electromotive force.

**emission**—In a vacuum tube, the ejection of electrons

from a metal surface such as a heated cathode. Also the RF energy that is radiated into free space by a radio transmitter.

**emission, electron**—The expulsion of electrons into space from the surface of a material. The emission is influenced by heat, light, potential difference, chemical disintegration, or impact of particles.

**emission, grid**—The ejection of electrons or ions from the grid of an electron tube.

**emission, secondary**—The liberation of electrons from an element other than the cathode as a result of being struck by high-velocity electrons. In tubes where plate emission is undesirable, a suppressor grid is employed to nullify it.

**emission, thermionic** — Ejection of electrons from a material due to the influence of heat on that material.

**emission velocity**—The initial velocity, or speed, at which electrons leave the surface of a cathode.

**emitter follower**—*See* amplifier, common-collector.

**emitter, transistor**—*See* transistor emitter.

**emt**—Abbreviation for electrical-metallic tubing. *See* conduit.

**end-fire antenna array**—*See* antenna, end-fire.

**end effect** — The capacitive effect at the end of an antenna. Also the inductive effect exhibited at the end of a coil.

**energy dissipation**—Loss of energy from a system due to the conversion of work energy into undesirable forms. An example is heat loss in a mechanical system due to friction.

**energy, radiant**—Energy that is transferred by electromagnetic radiation without a corresponding transfer of matter.

**engine noise** — Interference produced by the electrical and ignition systems of engines that interferes with the transmission and reception of radio signals.

**envelope, demodulation** — See demodulation envelope.

**E plane**—The plane of an antenna or radio wave that lies parallel to the lines of force in the electric field (perpendicular to the H plane).

**erg**—Basic unit of work in the cgs system. It is equal to the work accomplished by a force of one dyne acting through a distance of one centimeter.

**E region**—A region in the atmosphere occupied by the E layer that lies approximately 60 to 90 miles above the earth's surface.

**ESR**—Abbreviation for effective signal radiated. See effective radiated power.

**ether** — The theoretical medium through which electromagnetic waves (i.e., radio and light waves) propagate. Theoretically it is that which remains when air is evacuated.

**ev** — Abbreviation. See electron volt.

**E waves**—See waves, E.

**excitation**—Also called drive and stimulus. A driving force applied to a device or system to cause it to respond in some desired manner. In radio transmitters excitation is in the form of an RF signal originating in the oscillator stage.

**excitation, shock**—See shock excitation.

**exciter**—A circuit or device which generates a signal for driving or stimulating another circuit or device. In a radio transmitter the exciter may consist only of an RF oscillator which generates the carrier signal, or it may include other RF stages (i.e., frequency multipliers, etc.) as well. A low-power transmitter, for example, may be used as an exciter to drive a higher-powered transmitter. The term exciter is also given that element of directional



antenna that is connected directly to the source of RF energy (the transmitter).

**expansion, audio**—A method of increasing the amplitude of audio signals to compensate for compression previously introduced. *See* compression, signal.

**expansion, signal**—A method of increasing the amplitude

range of a signal. A method of returning a signal to its original form after it has been compressed. *See* compression, signal.

**extinction potential**—The lowest plate voltage value at which a gaseous tube will conduct.

**extraordinary wave** — *See* wave, ordinary.

## F

**F**—Symbol used to denote (1) Farenheit (2) ionized layer of atmosphere.

**f**—Abbreviation for frequency.

**facsimile communication**—A system of transmitting and reproducing photographs and printed matter by means of wire or radio-communication. The image is first broken down into electrical signals and then transmitted to a facsimile receiving device.

**fader**—A variable attenuator designed to make a smooth transition between two signals.

**fading**—The process of reducing the level of one signal while increasing the level of another. The diminishing or increasing of a signal level.

**fanned-beam antenna** — *See* antenna, fanned-beam.

**farad**—A unit of capacity that will store one coulomb of electrical energy when one volt of electrical pressure is applied.

**Faraday shield** — An electrostatic shield composed of parallel wires connected together at one end and grounded. This shield does not block magnetic fields.

**Federal Communications Commission (FCC)**—A governmental body appointed by

the President to allocate frequencies and to establish and enforce the rules and regulations connected with all communications in the United States.

**feedback**—Energy that is extracted from a high-level point in a circuit and applied to a lower level. Positive feedback reduces the stability of a device and is used to increase the sensitivity or produce oscillation in a system. Negative feedback increases the stability of a system as the feedback in an amplifier improves stability and fidelity.

**feeder**—The lines used to transfer electrical power from a main source to a distribution point. The transmission lines between a transmitter and the antenna system.

**ferrite**—A compound containing ferric oxide. Used as the core material in high frequency devices because of its low-loss characteristics.

**ferro**—A prefix that indicates a connection with iron, as in ferromagnetic.

**ferrous**—Composed of and/or containing iron. A ferrous metal as opposed to a non-ferrous metal, such as aluminum.

**fidelity**—The accuracy with

which a device will reproduce a signal. Applied particularly to audio amplifiers.

**field, E**—*See* field, electric.

**field, electric**—An area of electric force which is capable of acting on a charged body. The attraction or repulsion between two charged bodies is the result of an electric field existing between them.

**field, electromagnetic** — A magnetic field that exists as a result of electron flow.

**field, electrostatic**—An electric field that is produced by stationary, or static, charges.

**field intensity** — *See* field strength.

**field, magnetic** — The space through which the magnetic lines of force pass.

**field strength**—The intensity of the electromagnetic waves from a particular station. Measured at a given point in space and usually expressed in microvolts or millivolts per meter.

**field-strength meter**—*See* meter, field-strength.

**filament** — Resistance wire through which current is passed to perform a specific function. In an electric lamp the filament is energized to provide illumination. In a vacuum tube the filament may be heated to produce electron emission

from its surface, or it may be used to heat a separate element that is referred to as an indirectly heated cathode. In the latter case the filament is called a heater. When the filament itself is the primary electron-emitting element, it becomes the cathode.

**filament reactivation** — Term given the process whereby the filament voltage of a tube having below-normal emission is increased beyond the rated value either temporarily or permanently to extend the useful life of the tube.

**filter** — A selective network of resistors, coils, or capacitors connected in such a way as to offer selective opposition to certain frequencies, voltages, or currents. *See* specific filter type.

**filter, band-elimination** — Filter network designed to attenuate a specific band of frequencies. Neither of the cutoff frequencies are zero or infinite, and the filter passes frequencies on either side of the undesired band. (Also called a band-stop filter.)

**filter, bandpass**—A wave filter that passes a desired band of frequencies but greatly attenuates adjacent frequencies.

**filter, brute-force**—Term used

for ordinary power-supply filters that depend on large values of capacitance and inductance rather than on resonant effects of tuned filters to smooth out ripple frequencies.

**filter, capacitor-input**—An inductance-capacitance, power supply filter that uses a capacitor as the input component.

**filter choke**—*See* choke, filter.

**filter, choke-input**—Filter network having an inductance (often a swinging choke) as the input element. The DC output voltage from this filter is generally less than when capacitor input is employed, but the choke-input filter affords improved voltage regulation.

**filter, crystal**—A highly selective circuit that discriminates against all signals except those at the center frequency of the crystal employed. The crystal serves as the selective element.

**filter, decoupling**—Filter network to prevent interaction between two circuits.

**filter, harmonic**—A filter consisting of an inductance and a capacitance that are tuned to resonate at the undesired harmonic in order to suppress it.

**filter, hash**—A filter commonly used in vibrator power-

supply circuits to suppress the hash-type noise produced by the contact points. Also used to suppress similar types of noise produced in power supplies using mercury-vapor rectifiers.

**filter, high-pass**—An inductance-capacitance network designed to pass currents at all frequencies above a given limit, while at the same time greatly attenuating all frequencies below this limit. A device sometimes connected at the antenna terminals of a radio or television receiver to prevent interference from signals below a specific frequency or band of frequencies.

**filter, interference** — A device or circuit generally containing a combination of inductance and capacitance connected between the source of interference and a radio receiver to attenuate the interfering signals.

**filter, inverse feedback** — A tuned circuit connected at the output of a highly selective amplifier using negative feedback. Generally its function is to permit feedback at all frequencies except that at which the circuit is resonant.

**filter, key-click**—A filter that suppresses undesirable key-clicks caused by current

surges when the keying circuit of a transmitter is opened and closed. Also referred to as a click filter and key-chirp filter.

**filter, line**—A device or circuit that filters out or attenuates noise pulses and other types of interference that are present on AC power lines.

**filter, low-pass**—A circuit or device comprised of an inductance-capacitance network that passes all frequencies below a specific limit, but greatly attenuates all frequencies above this limit. A device normally connected in series with the RF output of a radio transmitter to prevent the radiation of spurious signals at harmonic frequencies.

**filter, noise**—A combination of electrical components designed to attenuate noise pulses but offer negligible loss to desired signals.

**filter, notch**—A filter network used in receivers to “notch out” or greatly attenuate a very narrow band of frequencies within a given passband, thus permitting interfering signals within this range to be suppressed. Generally the circuit is designed so that the position of the notch in an IF passband can be varied.

**filter, passband**—A combination of components that permits passage of frequencies within specific band limits while attenuating all frequencies outside these limits.

**filter, pi**—A network of three impedances arranged in such a manner that two are across the line and the third is connected in series. It is termed pi-network because the electrical arrangement resembles the Greek letter pi ( $\pi$ ).

**filter, T**—A network consisting of three impedances, two of which are in series with the line and the third is connected across the line from the junction of the first two. The arrangement resembles a T.

**final amplifier**—*See* amplifier, final.

**firing voltage**—The voltage at which current conduction takes place in a gas-filled tube. The ionization potential.

**fishbone antenna**—*See* antenna, fishbone.

**fist**—A slang term used in amateur radio to describe a CW operator's sending ability; i.e., an operator who has good rhythm and code-character formation is said to have a good fist.

**fixed-frequency transmitter**—*See* transmitter, fixed-fre-



- quency.
- fixed resistor**—A resistor that has a given value of resistance between permanently attached terminals. Not having a sliding or movable contact.
- fixed station** — *See* station, base.
- flash tube**—*See* tube, flash.
- F<sub>1</sub> layer**—An ionized layer of atmosphere at approximately 120 to 160 miles above the surface of the earth.
- F<sub>2</sub> layer**—An ionized layer of atmosphere between approximately 175 and 250 miles above the surface of the earth.
- flip-flop multivibrator** — *See* bistable multivibrator.
- floating grid**—*See* free grid.
- fluorescence**—The light emitted by certain materials when the material is radiated by light of another frequency. Also the light emitted by a material when bombarded by high-energy electrons.
- flux, magnetic**—The lines of force or direction in a magnetic field. The unit of magnetic flux is the maxwell and is a measure of the total lines per unit area.
- flywheel effect**—The storage of energy by a resonant circuit that permits it to continue through complete cycles with the application of short, in-phase energy pulses.
- FM**—Abbreviation for frequency modulation. *See* modulation, frequency.
- FM band**—*See* band, FM broadcast.
- FM discriminator** — *See* discriminator, FM.
- folded-dipole antenna**—*See* antenna, folded-dipole.
- forward bias** — A voltage across or a current through a diode in a manner that produces maximum current and the lowest resistance. Forward bias on a diode implies a negative voltage applied to the cathode and a positive voltage applied to the anode.
- Foster-Seeley discriminator**—A conventional FM discriminator that was originally developed as part of an automatic frequency-control system. (*Also see* discriminator, FM.)
- Frahm frequency meter**—*See* meter, Frahm frequency.
- Franklin antenna**—*See* antenna, collinear.
- free grid**—A grid in a vacuum tube that is electrically isolated from all tube and circuit elements. Also called a floating grid.
- free-running frequency** — *See* frequency, free-running.
- free-running oscillator** — *See* oscillator, free-running.
- free-space radiation pattern**—*See* radiation pattern, free-

space.

**F region**—A region of the atmosphere from approximately 120 to 250 miles above the earth's surface. Above the E region.

**frequency**—The number of times a periodic action occurs in a unit of time. The number of cycles that an electric current completes in 1 second. *See specific type.*

**frequency allocation**—A band of frequencies that have been designated for a specific use. The particular frequency that is assigned to a transmitting station.

**frequency, amateur**—Any of the frequencies that have been assigned for use by amateur radio stations.

**frequency, angular**—The frequency stated in radians per unit of time. The angular frequency is equal to the cycles per second multiplied by  $2\pi$ .

**frequency, audio**—The range of frequencies between 20 cycles and 20,000 cycles. A frequency that can be heard by the human ear.

**frequency band**—*See band.*

**frequency, calling**—A frequency set aside specifically for making the initial contact with a station after which both stations normally switch to another frequency to complete the

transmission.

**frequency, center**—The frequency of an unmodulated carrier.

**frequency changer**—A device or devices designed to receive power at one frequency and deliver power at a different frequency. Such devices include mercury vapor rectifiers, ignitions, vacuum tubes, and the conventional motor-generator set.

**frequency, channel**—*See channel.*

**frequency converter**—*See converter, frequency.*

**frequency, crystal**—*See crystal frequency.*

**frequency, cutoff**—The frequency at which a device effectively attenuates a signal. In a filter network or an amplifier the cutoff frequency is often given as a frequency that is 3 db down from a reference level established at another frequency.

**frequency deviation**—The amount by which a carrier changes from its center frequency.

**frequency discrimination**—*See discriminator, FM.*

**frequency distortion**—*See distortion, frequency.*

**frequency, distress**—Frequencies of 500 kc and 2,182 kc have been designated as distress frequencies, but any

frequency may be used that will attract attention and bring help. Distress frequencies are designated primarily for use by ship and aircraft stations.

**frequency diversity**—*See* diversity, frequency.

**frequency divider**—A circuit or device used to produce a submultiple of the input frequency.

**frequency doubler**—A circuit or device used to develop an output signal that is twice the frequency of the input signal.

**frequency drift**—The gradual change in the frequency of an oscillator due to temperature changes, voltage changes, etc.

**frequency, emergency** — Any frequency set aside strictly for emergency communications.

**frequency, free-running**—The frequency at which a synchronized oscillator operates when no synchronizing signal is present.

**frequency, fundamental**—The lowest or natural resonant frequency of a circuit or component. Also the lowest frequency component of a complex wave having harmonics.

**frequency, harmonic** — *See* harmonic frequency.

**frequency, heterodyne**—A frequency produced by com-

binning two dissimilar frequencies. The heterodyne frequencies will be the sum and difference of the two frequencies producing it.

**frequency, image**—*See* image frequency.

**frequency, infrasonic**—A frequency below the audio range (below 20 cycles). Also called subsonic frequency.

**frequency, intermediate**—The resultant frequency produced by the heterodyne process. In a radio receiver it is equal to the difference between the frequencies of the incoming RF signal and the signal produced by the local RF oscillator.

**frequency, line**—The frequency of the alternating current from the power-line source. The standard power-line frequency in the United States is 60 cycles per second.

**frequency, maximum usable**—In sky-wave propagation, the highest frequency at which radio signals will be reflected back to earth from regular ionized layers in the ionosphere.

**frequency meter**—*See* meter, frequency.

**frequency meter, absorption**—*See* meter, absorption frequency.

**frequency meter, Frahm** —

- See* meter, Frahm frequency.
- frequency meter, heterodyne** — *See* meter, heterodyne frequency.
- frequency modulation (FM)** — *See* modulation, frequency.
- frequency multiplier**—A circuit or device that generates harmonics of a sinusoidal signal and produces one of these harmonics as the output signal.
- frequency, natural**—The frequency at which a mechanical or electrical system will freely oscillate. The natural frequency of a tuned circuit is the resonant frequency.
- frequency, penetration** — The lowest frequency at which a radio wave, transmitted vertically into the atmosphere, will pass through a particular atmospheric layer. Also called critical frequency.
- frequency range**—A term used to express the frequencies that a device or circuit can effectively handle.
- frequency response** — The effect that a circuit or device has on the relative amplitude of frequencies in a given range.
- frequency, resting** — The assigned frequency of an FM station. The frequency of the carrier during zero modulation.
- frequency, ripple**—*See* ripple frequency.
- frequency shift**—A change in the frequency of an oscillator or a station carrier.
- frequency-shift transmission** — *See* transmission, frequency-shift.
- frequency stabilization**—The process of maintaining the frequency of an oscillating source within certain limits.
- frequency standard**—Any specific frequency held within certain tolerances and used for the measurement of other frequencies.
- frequency, subsonic**—Any given frequency that lies below the range of human hearing; i.e., below approximately 20 cps.
- frequency swing**—The act of a frequency varying from its reference value to some other value. The difference between the reference value and the value at the limit of the swing.
- frequency tolerance**—The degree to which a device will change in frequency when subjected to given environmental conditions.
- front-to-back ratio (antenna)** —The ratio of power gain between the front and rear of a directional antenna, usually expressed in decibels.
- full-wave rectifier**—*See* rectifier, full-wave.

**fundamental frequency** — *See* frequency, fundamental.

**fuse**—A protective device usually containing a short length of wire that melts and breaks the circuit when the current drawn through it exceeds a specific value.

**fuse block**—An insulated base to which one or more fuse holders are fastened.

**fuse, delay**—A fuse designed to withstand currents exceeding its normal rating for a brief period of time.

**fuse link**—The current-carrying portion of a fuse that melts when the current exceeds a predetermined value.

**fuse wire**—Wire made from a material having a low melting temperature.



## G

**G**—Symbol used to denote (1) grid of tubes on tube diagrams (2) conductance.

**gain**—The ratios of voltage, current, or power to a standard or previous reading. Usually expressed in decibels. *See* specific type.

**galena crystal** — *See* crystal, galena.

**Gallon**—Slang term used in amateur radio meaning 1 kw or 1,000 watts, transmitter input power.

**galvanometer, ballistic** — A galvanometer that is designed to indicate the quantity of current in an electric pulse. It can be used to check the value of a capacitor by discharging the capacitor through the galvanometer and interpreting the charge in terms of capacitance.

**gamma match**—A device used to match the impedance of an antenna to the transmission line. The center of the driven element is grounded, and the signal is fed to one side of center.

**gaseous conduction**—Current conduction through a gas due to ionization of the gas by an applied voltage.

**gas tube** — *See* tube, gas.

**gated-beam tube** — *See* tube, gated-beam.

**gauss**—Unit of magnetic flux

density; 1 maxwell/square centimeter.

**G C A** — Abbreviation. *See* ground-controlled approach.

**G D O**—Abbreviation for grid-dip oscillator. *See* oscillator, grid-dip.

**generator**—A mechanical device consisting primarily of an armature that is rotated in a magnetic field to convert mechanical energy into electrical energy. Also an electronic generator, such as a vacuum tube oscillator that produces AC voltage at a desired frequency. *See* specific type.

**generator, AC**—A device that converts mechanical energy into alternating current. Also an electrical circuit, such as an oscillator that generates alternating current.

**generator, audio**—An oscillator capable of producing AC voltage at audio frequencies.

**generator, DC** — A rotating mechanical device consisting of an armature and field used to generate direct current.

**generator, harmonic** — *See* harmonic generator.

**generator noise suppressor**—*See* suppressor, generator noise.

**generator whine**—A form of

interference in radio reception caused by arcing between the brushes and commutator of an automotive generator. It can be recognized as a high-pitched whine that varies in frequency as the engine speed is changed.

**germanium (Ge)** — Semiconductor, atomic number 32. Used in the production of germanium semiconductor devices.

**germanium diode**—*See* diode, germanium.

**germanium transistor** — *See* transistor, germanium.

**Gill-Morrell oscillator** — *See* oscillator, Gill-Morrell.

**gimmick** — A short length of wire that is soldered onto a circuit component and used as small adjustable capacitor. A gimmick is often two short insulated wires that are twisted together to form a capacitor.

**glow lamp**—*See* lamp, glow.

**G<sub>m</sub>**—*See* mutual conductance. (*Also see* transconductance).

**G M T** — Abbreviation. *See* Greenwich Mean Time.

**gnd** — Abbreviation for ground.

**goniometer**—A radio direction finder.

**government band**—*See* band, Government.

**Greenwich Mean Time**—The mean solar time at the me-

ridian at Greenwich. It is used as a synchronized basis for time throughout the world.

**grid**—A framework of fine wire mesh located between the cathode and plate of a vacuum tube. A lead plate in a storage battery.

**grid bias**—*See* bias, C.

**grid, buncher**—The grid in a klystron that acts on the electron stream to cause a grouping (bunching) of the electrons.

**grid, catcher**—The grid in a klystron that is acted on by the bunched electrons in the electron stream. Energy is transferred from the electron stream to the catcher.

**grid-cathode capacitance**—*See* capacitance, interelectrode.

**grid, control**—The electrode between the cathode and anode used to control the flow of electrons.

**grid-controlled rectifier** — *See* tube, thyatron.

**grid-dip oscillator (GDO)** — *See* oscillator, grid-dip.

**grid drive**—Term used for the excitation signal applied to the grid of a vacuum tube.

**grid driving power**—The power that must be used to obtain the required driving voltage for a class-C amplifier. Also called exciting voltage.

**grid emission**—*See* emission, grid.

**grid, injection**—The grid in a mixer tube to which the local oscillator signal is applied.

**grid-leak detection** — *See* detection, grid-leak.

**grid limiting**—*See* limiting, grid.

**grid modulation** — *See* modulation, grid.

**grid-plate capacitance** — The capacitance existing between the grid and the plate in a vacuum tube. (*Also see* capacitance, interelectrode.)

**grid, screen**—The second grid in a tube used to reduce the capacitive coupling between the grid and the plate. The shielding action also prevents the plate from attracting electrons from the cathode and therefore the screen grid must be positively charged.

**grid, suppressor**—A grid that is placed between the screen grid and the plate in a vacuum tube to prevent the flow of secondary electrons from plate to screen. This grid is usually connected to the cathode or to ground.

**grid voltage, critical**—The value of the voltage on the grid of a gas tube at which ionization takes place. The lowest value of voltage that will initiate conduction in a gas tube.

**ground**—An electrical connec-

tion to the earth, generally through a ground rod. Also a common return to a point of zero potential, such as the metal chassis in radio equipment.

**ground absorption** — *See* absorption, ground.

**ground-controlled approach (GCA)**—System of radio instrumentation and communication used to guide aircraft to safe landings during poor weather conditions.

**grounded cathode**—*See* amplifier, grounded-cathode.

**grounded grid**—*See* amplifier, grounded-grid.

**grounded plate**—*See* amplifier, grounded-plate.

**grounding switch**—A switch or similar device used to ground or short out a circuit or component. Generally used as a safety measure. *See* specific type.

**ground-plane antenna** — *See* antenna, ground-plane.

**ground potential**—The potential of the earth. A circuit, terminal or chassis, is said to be at ground potential when it is used as a reference point for other potentials in the system.

**ground-reflected wave** — *See* wave, reflected-ground.

**ground resistance** — The resistance offered to radio waves traveling through the ground system of an antenna. Ground resistance is not

the same at all frequencies; it varies considerably with soil conditions.

**ground system**—That portion of an antenna, radio receiver, transmitter, or any other device used as ground reference. The earth and any ground rods or conductors connected to it.

**ground wave** — *See* wave, ground.

**group velocity** — The speed with which energy travels between two points, assuming that the energy follows a straight path. The RF energy in a wave guide follows an irregular path that reduces the group velocity, even though the actual velocity of the RF wave is higher.

**G string**—A single-wire wave guide. A small diameter wire coated with a thin dielectric will guide a wave along its surface. The wave

must be launched along the wire with relatively large launching devices, making the G string practical only at the higher frequencies.

**guard band**—A band of unused frequencies existing on either side of a channel to provide separation between signals of stations having adjacent-frequency assignments. The purpose of the guard band is to prevent adjacent-channel interference.

**guard band, interference** — *See* guard band.

**guided wave**—*See* wave, guided.

**guy anchor**—The supporting device to which the lower end of a guy wire is attached.

**guy wire**—A stranded steel wire or cable used primarily to support antenna structures such as towers and masts.

## H

**H**—Symbol used to denote (1) henry and (2) magnetic intensity.

**half-wave antenna**—*See* antenna, half-wave.

**half-wave rectifier**—*See* rectifier, half-wave.

**Hall-effect device**—A device in which the direction of current is controlled by a magnetic field. Usually a semiconductor device.

**halo antenna**—*See* antenna, halo.

**ham**—Slang for an amateur radio operator; a person who is duly licensed to operate and experiment with a radio station as a hobby rather than a business.

**handset**—A device very similar to a telephone handset, having a transmitter and receiver mounted at either end of a single frame. The radio handset generally has a push-to-talk button located between the two transducers.

**harmonic analyzer, heterodyne**—*See* analyzer, heterodyne harmonic.

**harmonic antenna**—*See* antenna, harmonic.

**harmonic distortion**—Distortion of a sine wave by harmonics that are introduced into the waveform by non-linear amplification.

**harmonic filter**—*See* filter,

harmonic.

**harmonic frequency**—A frequency at some multiple of the fundamental or natural resonant frequency. It can be either an even (2nd, 4th, etc.) or odd (3rd, 5th, etc.) harmonic.

**harmonic generator**—A device, usually a tube or transistor, which has strong harmonics of the input frequency present in its output circuit.

**harmonic oscillator**—*See* oscillator, harmonic.

**harmonic suppressor**—A circuit or device designed to filter out, bypass to ground, cancel, or otherwise suppress undesirable harmonic frequencies.

**harmonic wave analyzer**—*See* wave analyzer, harmonic.

**Hartley oscillator**—*See* oscillator, Hartley.

**hash**—A type of interference produced by man-made devices, particularly those which experience arcing as contacts open and close. Automotive voltage regulators and power-supply vibrators are two common examples.

**hash filter**—*See* filter, hash.

**headphone**—A small sound reproducing device used either singly or in pairs to permit private listening.



Used in applications where the strength of audio signals is insufficient to drive a speaker. Also called ear-phone.

**headphone adaptor**—A device that is placed under the audio-output tube or connected in some other way to a radio receiver to provide terminals to which headphones can be connected.

**heater, tube**—The resistive wire used as a heating element for the cathode of a vacuum tube. Also called filament in tubes where the resistance wire itself is the cathode or electron emitting element. (*Also see filament.*)

**heating, induction**—*See* induction heating.

**heat radiator**—A device that is designed to absorb heat from tubes, transistors, heat sinks, etc., and to radiate this heat into space via large exposed areas and finned surfaces.

**heat sink**—A relatively large block of metal into which a quantity of heat can be absorbed. The heat sinks into the metallic mass and this heat must be dissipated by liquid or air cooling to prevent excessive temperature rise. (*Also see heat radiator.*)

**Heaviside Layer**—Also called

Kennelly-Heaviside layer. A region extending from approximately 50 to 400 miles above the earth and containing ionized gases which are capable of bending radio signals back to earth. Supposedly consisting of several individual layers (i.e., D, E, and F) which continually vary in altitude and ionization properties with changes in weather, season of the year, and even the time of day.

**Heising modulation** — *See* modulation, constant-current.

**helical antenna**—*See* antenna, helical.

**helical loading**—A method of loading an antenna by inserting a helical coil in series with the antenna or using a stretched out helix as the radiating element. The latter is also called a continuously loaded antenna.

**helix**—A spiral-shaped coil such as a screw thread or coil spring. Any single-layer, flat-wound coil.

**henry**—A practical unit of inductance that will produce a voltage drop of 1 volt when the current changes at the rate of 1 ampere per second.

**heptode**—*See* tube, heptode.

**Hertz antenna**—*See* antenna, Hertz.

**heterodyne**—The mixing of two different frequencies in a nonlinear device to produce sum and difference frequencies. Many applications of the heterodyne effect are employed in *wavemeters, oscillators, detectors, superheterodyne receivers, etc.*

**heterodyne frequency** — One of the frequencies produced by mixing two different frequencies in a nonlinear device. Two heterodyne frequencies are produced by heterodyne action. These frequencies represent the sum of and the difference between the original two frequencies.

**heterodyne frequency meter** —*See* meter, heterodyne frequency.

**heterodyne harmonic analyzer** —*See* analyzer, heterodyne harmonic.

**hexode** — *See* tube, hexode.

**HF**—Abbreviation for high frequency.

**high-level modulation** — *See* modulation, high-level.

**high-pass filter**—*See* filter, high-pass.

**high tension**—A term applied to circuits and lines that carry extremely high potentials.

**hole (semiconductor)**—A term used to designate a positive charge in a semiconductor material. Holes act as a

mass equivalent to that of an electron but of opposite polarity. The use of the term hole is mainly restricted to discussions of nuclear physics and semiconductor theory.

**hop**—*See* skip.

**horizon, radio**—*See* radio horizon.

**horizontally polarized wave**—*See* wave, horizontally polarized.

**horsepower**—A rate of doing work. One horsepower is equal to 746 watts or equivalent to the amount of energy required to raise 550 pounds 1 foot per second.

**H pad**—A pad in which the resistive elements are connected in a configuration that resembles the letter H. *See* pad.

**hum**—A term used to describe the 60- or 120-cycle sound present in the sound of some communications equipment. Usually hum is the result of undesired coupling to a 60-cycle source or to the defective filtering of 120-cycle ripple output of a rectifier.

**hum modulation**—*See* modulation, hum.

**hysteresis loop**—A graphic representation of the magnetization of iron or steel plotted against the magnetizing force for one complete cycle of alternating

current.

**hysteresis loss**—The heat developed in a magnetic substance when it is immersed in an alternating-current field. The heat energy is

proportional to the area inside the hysteresis loop. Heat is said to be generated by the turning of the elementary magnets within the material.

- I**—Symbol used to designate current.
- IC**—Symbol used to designate internal connection on tube diagrams.
- $I_{cbo}$  (transistor)** — Parameter symbol for collector-to-base current, with the emitter open circuited.
- $I_{ceo}$  (transistor)** — Parameter symbol for collector-to-emitter current, with the base open circuited.
- ICW**—Abbreviation for interrupted continuous wave. *See* wave, interrupted continuous.
- IEEE**—Abbreviation for Institute of Electrical and Electronic Engineers.
- IF**—Abbreviation for intermediate frequency. *See* frequency, intermediate.
- ignition interference**—*See* interference, ignition.
- ignitron**—*See* tube, ignitron.
- image antenna**—*See* antenna, image.
- image frequency**—A frequency on one side of the oscillator frequency, opposite that of the desired frequency.
- image interference**—A type of interference resulting in two signals being heard simultaneously, one being the desired signal and the other the image frequency of the undesired signal.
- impact excitation**—*See* shock excitation.
- impedance**—The total opposition a circuit or component offers to the flow of alternating current. It includes both resistance and reactance and is generally expressed in ohms. *See* specific type.
- impedance, antenna terminal**—The effective impedance at the point where the transmission line connects to the antenna. The impedance of an antenna is not necessarily the same at all points.
- impedance match**—A condition whereby the impedance of a particular circuit or component is the same as the impedance of the circuit or device to which it is connected.
- impedance-matching stub**—A section of transmission line or a pair of conductors cut to match the impedance of a load. Also called matching stub.
- impedance-matching transformer**—A transformer designed to match the impedance of one circuit to that of another.
- impedance, terminal** — The impedance that is measured at the terminals of a circuit or device.

## **impulse noise**

**impulse noise**—*See* noise, impulse.

**incident wave**—*See* wave, incident.

**indicator**—A meter, tuning eye, or other device used to inform an observer of a condition or change in condition. Generally a meter or tuning eye used to indicate a voltage or current.

**indicator, cathode-ray** — *See* tube, electron-ray tuning indicator.

**indicator, level**—A meter or other device that is arranged to indicate the level or magnitude of a voltage, current, or signal.

**indicator, null**—A meter, tuning eye, or other device used to denote any change from zero. Null indicators are used where extreme accuracy is desired and a null indication is often more accurate than a deflection indication.

**indicator tube**— *See* tube, electron-ray tuning indicator.

**indirectly heated cathode**—*See* cathode.

**indirect current** — The current present in a conductor because of the presence of electric, magnetic, or electromagnetic fields.

**indirect wave**—*See* wave, indirect.

**inductance-tube modulation**—

## **instantaneous power output**

*See* modulation, inductance-tube.

**induction heating**—Heating a conducting material by placing it in a rapidly changing magnetic field. The changing field induces electric currents in the material and  $I^2R$  losses account for the resultant heat.

**industrial band** — *See* band, industrial.

**inert gas**—The inert gasses are those elements that have the maximum number of electrons in each energy level. The inert gasses are helium, neon, argon, krypton, xenon, and radon.

**infrared**—A region of the electromagnetic radiation spectrum at about 7,000 angstroms. Infrared is the radiation just below the visible light frequencies.

**infrasonic**—*See* frequency, infrasonic.

**injection grid** — *See* grid, injection.

**insertion loss**—The energy absorbed by a transducer that is inserted into a transmission circuit. Insertion loss is the ratio of power delivered directly to a circuit to that delivered to the circuit after insertion of the transducer. It is usually measured in decibels.

**instantaneous power output**—  
The energy delivered to a



- load at any particular instant.
- instantaneous value**—The value of a quantity at any particular instant.
- insulator, metallic**—Shorted lengths of transmission line or stubs, which, at odd numbers of quarter-wave-length multiples, have extremely high impedances that make it possible to use them as insulators.
- intercarrier noise suppression**—A system of suppressing the noise of a high-gain receiver when it is tuned between stations.
- intercom**—Short for intercommunications system.
- intercommunication**—Communication between two or more points in a closed-circuit system.
- interelectrode capacitance**—*See* capacitance, interelectrode.
- interference**—Disturbances of an electrical or electromagnetic nature that introduce undesirable responses into other electronic equipment. (*Also see* specific type.)
- interference, adjacent-channel**—That interference which is caused by a signal originating in an assigned, adjacent channel.
- interference, atmospheric**—Electrical disturbances generated by the atmosphere that cause undesired responses in electronic equipment.
- interference, background**—Undesired noises that are present along with the desired signal.
- interference band**—*See* guard band.
- interference, broadcast**—Any transmitted signal that interferes with the reception of a broadcast signal.
- interference, electrical**—Usually pertains to electrical disturbances introduced into power lines by equipment such as welders, brush-type motors, circuit breakers, etc.
- interference filter**—*See* filter, interference.
- interference guard band**—*See* guard band.
- interference, heterodyne**—The audible whistle heard in a receiver when two stations having nearly the same frequencies are received.
- interference, ignition**—The electromagnetic radiation produced as a result of the high voltages used in engine ignition systems.
- interference, image**—*See* image interference.
- interference, intermodulation**—The undesired frequencies produced when different frequencies mix in a nonlinear device.
- interference, man-made**—Any

electrical disturbance produced by other than natural means. Electrical disturbances produced by a man-made device as opposed to a disturbance produced by nature.

**interference, selective**—Electrical or electromagnetic disturbances that occur at discrete points in the radio spectrum.

**interference, static** — Electrical discharges in the atmosphere that interfere with radio reception.

**interference, television (TVI)** —Unwanted electrical or electromagnetic disturbances that occur at the same frequency as television broadcast.

**interference, wave**—The variation of wave amplitude caused by the reaction of two waves having the same frequency but changing phase.

**interlock**—A safety device that opens a circuit, or grounds a dangerous potential when a protective covering is removed.

**intermediate frequency (IF)**—A frequency to which a signal is converted for ease of handling. Receives its name from the fact that it is an intermediate step between the initial and final conversion or detection stages.

**intermittent duty**—Operation of a device at intervals interspaced with periods of nonoperation. An on-off type operation.

**intermittent-duty rating** — Designation on a device that states the length of time a device may be operated in a given time span, called a duty cycle; e.g., two minutes on/three minutes off.

**intermittent operation** — A periodic malfunction. Usually applied to a defective device that goes on and off at undesirable intervals.

**intermodulation** — The process by which the various frequency components modulate each other in a non-linear network. (*Also see* distortion, modulation.)

**intermodulation distortion** — *See* distortion, intermodulation.

**intermodulation interference** —*See* interference, intermodulation.

**International Morse code** — *See* Morse code, International.

**interrupted continuous wave (ICW)**—*See* wave, interrupted continuous.

**interstage**—A term used to describe components used between stages, e.g., interstage transformer.

**inverse-feedback filter** — *See* filter, inverse feedback.

**inverted amplifier** — *See*

grounded-grid amplifier.

**inverted-L antenna**—*See* antenna, inverted-L.

**inverter, DC to AC**—A device that changes DC into AC. Composed of tubes, transistors, or mechanical vibrators that switch the current in the primary circuit of a transformer and thereby develop an AC component in the output circuit.

**inverter, phase**—A circuit or device used to change the phase of a signal by  $180^\circ$ . Usually employed where both phases are required, such as driving a push-pull amplifier.

**ion**—An atom or molecule that has acquired a positive or negative charge.

**ionization**—The formation of ions. Ions are produced when polar compounds are dissolved in a solvent and when a liquid, gas, or solid is caused to lose or gain electrons due to the passage of an electric current.

**ionization current**—An electric current that produces ions when passed through a solid, gas, or liquid.

**ionization layer**—A layer or layers of atmosphere ionized by radiation from the sun. *See* specific layer; D, E,  $F^1$ ,  $F^2$ .

**ionization voltage** — The potential at which a material ionizes. The potential at which an atom gives up an electron.

**ionosphere**—The region of the earth's atmosphere (between about 30 and 300 miles above the earth's surface) that is ionized by the radiation of the sun. This region affects the transmission of radio waves.

**ionospheric storm** — Fluctuations in the degree of atmospheric ionization that are produced by sunspot activity. During violent sunspot activity the ionospheric storms are capable of crippling certain communications services.

**ionospheric wave**—*See* wave, ionospheric.

**$I^2R$** —Formula for power in watts. *See* watt.

**IR drop**—A method of designating a voltage drop in terms of both current and resistance.

**IRE**—Abbreviation. *See* Institute of Radio Engineers.

**iron loss**—*See* hysteresis loss.

**ISM**—Abbreviation for industrial, scientific, and medical equipment. (*Also see* band, industrial.)

**isolation network** — *See* network, isolation.

## J

**jack**—A plug-in, spring-type terminal used for temporary connections.

**JAN specification** — Abbreviation for Joint Army-Navy specification.

**J antenna**—*See* antenna, J.

**JETEC** — Abbreviation for Joint Electron Tubes Engineering Council.

**joule**—The unit of electrical energy or work. One joule is equal to one watt-second.

**J/S ratio**—The ratio of the total interference power to signal-carrier power in the transmission medium as measured at the receiver. The J/S ratio is generally expressed in decibels.

**jumper**—Any conductor used for making temporary connections between two points or for shorting out a circuit or component.

**junction box**—Any box or enclosure into which two or more conductors are led and connected. Generally a box containing an insulated board with a number of terminals for making connections.

**junction station**—A term used for a microwave relay station that connects one or more legs of the microwave system to the main or through route.

## K

**K** — Abbreviation for Kelvin.

**k** — Abbreviation for kilo.  
Symbol for 1,000.

**kc** — Abbreviation for kilocycle.

**keep-alive anode**—A holding or excitation anode of a vacuum tube or similar device.

**Kelvin** — The absolute temperature scale. Equal to the centigrade value plus 273.16.

**Kennelly-Heaviside layer** — A layer of ionized gas supposed to exist between 50 and 400 miles above the earth. Discovered by Arthur E. Kennelly and Oliver Heaviside. *See* Heaviside layer.

**kenotron**—*See* tube, kenotron.

**kev**—Abbreviation for 1,000 electron volts.

**key** — A mechanical device designed for rapid opening and closing of a circuit to produce coded signals.

**key chirp(s)**—A particular sound associated with code signals produced by an unstable transmitter which shifts slightly in frequency as it is keyed.

**key-click filter** — *See* filter, key-click.

**key-click(s)** — An undesired noise caused by the abrupt current change when a telegraph key is opened and

closed.

**keyer**—An electronic or mechanical device that either modulates or breaks up the RF output of a radio transmitter into coded pulses.

**keyer, automatic**—A device that produces coded pulses of the proper duration when actuated by either electronic or mechanical means. (*Also see* keyer, electronic.)

**keyer, electronic** — An electronic device that produces coded signals of the proper duration and timing relationship despite inconsistencies in the manipulation of the key.

**keyer, mechanical** — A mechanical device that is either actuated automatically or manually to form coded electric pulses. (*Also see* keyer, tape.)

**keyer, tape**—A mechanical or electronic device that is actuated by a specially processed tape. It may be perforated paper tape that causes a set of contacts to open and close at the desired intervals, or it may be in the form of an inked paper tape. In the latter instance an inked line on the tape is pulled past a small aperture above a light sensitive cell. When the tape comes to a point



where the inked line is off-set, light is permitted to pass through the aperture to the cell, causing an audio oscillator or similar electronic device to be keyed.

**keying, back-shunt**—A method of keying whereby the RF energy from the transmitter is fed to the antenna when the telegraph key is closed, and to a dummy load when the key is open.

**keying, blocked-grid** — A method of keying a radio-telegraph transmitter in which one or more stages of the transmitter are cut off, or blocked, by grid bias. Only when the telegraph key is closed is the bias removed and full transmitter output permitted to reach the antenna.

**keying, break-in** — A keying system in which the radio transmitter and the receiver are operated simultaneously to permit the operator to receive incoming signals during keying intervals.

**keying, cathode** — A method of keying a transmitter whereby the DC circuits of the grid and plate of the keyed stage are opened simultaneously by breaking the plate return lead to the cathode or to the center tap of the filament in tubes which do not use an indirectly heated cathode.

**keying, center-tap**—*See* keying, cathode.

**keying, nodal-point**—In an arc transmitter, keying at a point that is essentially at ground potential in the antenna circuit.

**keying, plate**—A method of keying in which the plate-supply circuit of the keyed stage in a radio transmitter is interrupted.

**keying, single-tone** — A keying system whereby the carrier is modulated by a single tone for one condition which may be either (but not both) spacing or marking.

**keying, two-tone**—Keying in which the modulating signal causes the carrier to be modulated by two frequencies, one for spacing and the other for marking.

**keying wave**—Also called marking wave. *See* wave, keying.

**key, semiautomatic** — A type of key that is actuated from side to side rather than up and down. Throwing the key to the right and holding it there automatically produces a series of evenly spaced dits, whereas the dahs must be formed individually by moving the key knob to the left. This type of key is generally referred to as a "bug."

**key station**—*See* station, base.

**key station**—*See* station, base.

**kilo**—Prefix meaning 1,000; i.e., 1 kilowatt is equal to 1,000 watts. Other examples are kilovolt, kiloampere, etc.

**klystron**—*See* tube, klystron.

**klystron, reflex** — *See* tube, klystron.

**knockout**—A removable portion of a box, cabinet, or chassis. Usually a semi-cut area that can readily be knocked out with a ham-

mer or punch.

**KOVAR** — A nickel-cobalt-iron alloy used in the glass-to-metal seal of vacuum tubes.

**kv** — Abbreviation for kilovolt.

**kva** — Abbreviation for kilovolt ampere.

**kw** — Abbreviation for kilowatt.

**kwh**—Abbreviation for kilowatt hour.

## L

**L**—Symbol for inductance and abbreviation for lambert.

**lamp**—*See* specific type.

**lamp, arc**—A lamp that produces light when current passes between two electrodes through an ionized gas.

**lamp, argon**—Lamp containing argon gas, which gives off a purple light when ionized. Sometimes used in vacuum tubes to increase conduction.

**lamp, glow**—A lamp that produces light when a glow discharge occurs between two electrodes due to ionization of a gas or vapor that has been introduced within the envelope. The characteristics of the light are determined by the type of gas employed. Neon, for example, exhibits a reddish orange glow, mercury vapor has a blue glow, and argon produces a purple glow.

**lamp, neon**—A type of glow lamp that produces light when voltage of sufficient magnitude, applied to internal electrodes, ionizes the neon gas within the envelope. Neon lamps find common usage as RF indicators, pilot lamps, feedback paths in relaxation oscillator circuits, etc.

**land-based station**—*See* sta-

tion, land-based.

**land line**—A common slang term used in amateur and Citizens band radio meaning telephone. Also referred to as the twisted pair.

**L antenna**—*See* antenna, inverted L.

**LASER** — An acronym for Light Amplification by Stimulated Emission of Radiation. A method of producing coherent light in which the energy level of the atoms in a material is pumped to a higher level by a light source; the energy is then triggered in a manner that produces an electromagnetic radiation which has characteristics similar to a radio wave.

**launching**—The transferring of RF energy from a coaxial cable or shielded pair into a wave guide.

**LC constant**—*See* time constant.

**lead dress**—The placement or routing of wiring and component leads in an electrical circuit.

**lead-in**—The conductor that provides the path for RF energy between the antenna and the radio receiver or transmitter.

**leakage**—The undesirable passage of current over the surface or through an in-

sulator.

**leakage radiation**—Radiation of energy from any device or circuit at an undesired point.

**lecher wires** — Parallel wires that are coupled to a receiver or transmitter for measuring wavelength. The wires form a transmission line along which standing waves appear, and the wavelength is equal to twice the distance between any two consecutive current nodes.

**Leclanche' cell**—*See* cell, Leclanche'.

**level**—A measure of the difference between a quantity or value and an established reference. (*Also see* specific type.)

**LF**—Abbreviation for low frequency. *See* band, LF.

**license, station**—*See* station license.

**lid**—A slang term used in amateur radio to denote a poor CW operator.

**light modulation**—*See* modulation, light.

**lightning arrester**—A protective device that is connected between a transmission line and ground to protect equipment from the high potentials induced by lightning discharges.

**lightning rod**—A pointed metal conductor that is mounted above the structure it is designed to protect. The rod

is connected to ground by a high-current-capacity conductor, and the combination is designed to guide lightning away from the structure and also to ionize the surrounding air to prevent the direct strike of a lightning discharge.

**lightning switch**—A relay or manual switching device used to ground the antenna input to a radio receiver to preclude damage by lightning. The grounding switch is used only when the receiver is inoperative.

**light-sensitive cell**—*See* photoelectric cell.

**limiter**—A circuit that is designed to limit the magnitude of a signal. An FM limiter is used to remove amplitude modulation by clipping the positive and negative peaks. Also called clipper, peak clipper, and peak limiter.

**limiter, amplitude**—A circuit designed to limit the magnitude of a signal or voltage.

**limiter, audio-peak**—A circuit designed to limit the amplitude of an audio signal. Particularly useful in limiting the output of a code receiver to reduce total noise.

**limiter, saturation**—An amplifier that is designed to reach saturation on very small signal excursions. Portions of the input signal that ex-

ceed these limits are not amplified and, therefore, are effectively clipped from the output waveform.

**limiting, grid**—A limiting process in which the signal drives the grid more positive than the cathode; the grid draws current and prevents the signal from increasing beyond this value. The grid and cathode operate in a manner that is similar to the anode and cathode of a diode clipper.

**linear**—Refers to a straight line. The straight portion of a tube characteristic is the linear portion. An amplifier with a linear frequency response will amplify all frequencies to the same degree. A device having elements that are arranged in line is often referred to as a linear device.

**linear amplifier**—*See* amplifier, linear.

**linear antenna** — An antenna that has its radiating elements arranged in a straight line.

**linear balun** — A balun constructed of sections of transmission line. It is placed between the transmission line and load.

**linear detection** — *See* detection, linear.

**linearly polarized wave**—*See* wave, linearly polarized.

**linear rectification**—*See* rec-

tification, linear.

**line, balanced** — A two-wire transmission line that carries identical signals on both conductors. Neither conductor of a balanced line is normally signal-grounded. The ribbon-type twin lead is a balanced line.

**line balance converter** — *See* balun.

**line, delay**—*See* delay line.

**line drop**—A voltage loss occurring between any two points in a power or transmission line. Such loss, or drop, is due to the resistance, reactance, or leakage of the line. An example is the voltage drop between a power source and load when the line supplying the power has excessive resistance to the amount of current being drawn through it.

**line equalizer**—A reactance (inductance and/or capacitance) connected in series with a transmission line to alter the frequency-response characteristics of the line.

**line filter**—*See* filter, line.

**line frequency** — *See* frequency, line.

**line level**—The level of a signal at a certain point on a transmission line. Usually expressed in decibels.

**line microphone**—*See* microphone, directional.

**line noise**—*See* noise, line.

**line-of-sight communications**

—A transfer of intelligence between two points over an unobstructed, or optical, path.

**line-stabilized oscillator**—*See* oscillator, line-stabilized.

**line, transmission**—*See* transmission line for specific type.

**line, unbalanced**—A two-conductor transmission line having one conductor at signal ground. The coaxial cable is an example of an unbalanced line.

**line voltage**—*See* voltage, line.

**line-voltage regulator** — *See* regulator, line-voltage.

**link-coupling** — *See* coupling, link.

**link, fuse**—*See* fuse link.

**litz wire**—*See* wire, litz.

**LO**—Abbreviation for local oscillator. *See* oscillator, local.

**load**—(1) A device that consumes or converts the energy delivered by another device. (2) The amount of energy delivered by an electric or electronic device.

**loaded line**—A transmission line that has lumped elements (inductance or capacitance) added at uniformly spaced intervals. Loading is used to provide a given set of characteristics to a transmission line.

**loading coil**—*See* coil, antenna loading.

**loading error**—The difference

between the actual value and the indicated value caused by the loading effect of the measuring instrument.

**load line (tube)**—A straight line on a dynamic characteristic curve for a tube or transistor, the slope of which represents the reciprocal of the resistance of the load.

**load matching**—Making the impedance of a load equal to the internal impedance of an energy-producing device. When the impedance of the two devices are equal, a maximum transfer of energy will occur. Also called impedance matching.

**lobe**—Also called directional or radiation lobe. One of the areas of greater response in the directional pattern of an antenna, microphone, etc. The area of greatest response in a pattern is the major lobe, and the lesser response or responses are called minor lobes.

**lobe, antenna**—An area of greater response in the radiation pattern of an antenna. Its size and shape are plotted by making a series of field-strength measurements at various locations around the antenna. The area of greatest intensity is called the major lobe and other responses in the pattern are referred to as minor lobes.

**locking relay**—*See* relay, lock-



ing.

**loctal (loktal)**—A tube basing arrangement for an eight-pin tube that locks the tube base to the socket. The center guide pin on the tube base inserts and locks into the socket.

**log**—*See* station log.

**logging**—Making a written record of station operation. Entries generally include such things as the time, operating frequency, type of emission, transmitter power, etc.

**logging scale**—A scale used on communications receivers as a reference for logging and relocating stations of particular interest. The scale is usually divided into small increments.

**long wave**—The wavelengths at about 300 kc and below.

Term used to describe equipment that operates at these frequencies.

**long-wire antenna**—*See* antenna, long-wire.

**loop antenna** — *See* antenna, loop.

**loopstick antenna**—*See* antenna, loopstick.

**loss**—Refers to the portion of the energy applied to a system that performs no useful work. *See* specific type of loss.

**loudspeaker**—*See* speaker.

**low-level modulation** — *See* modulation, low-level.

**low-pass filter**—*See* filter, low-pass.

**L Pad**—A pad in which the resistive elements are connected in a configuration that resembles the letter "L." *See* Pad.

## M

- M**—Abbreviation for mutual inductance.
- ma**—Abbreviation for milli-ampere.
- magic eye**—*See* tube, electron-ray tuning indicator.
- magnetic flux**—*See* flux, magnetic.
- magnetic field**—*See* field, magnetic.
- magnetic storm**—A disturbance in the magnetic field of the earth which is capable of disrupting both radio and wire transmission.
- magnetism**—A property of electron movement. A static charge possesses an electric field, but if the electrons are moved, a magnetic field is produced around the electrons and at right angles to the electron movement. The magnetic properties of such fields can affect certain ferromagnetic substances, and some will also permanently maintain a magnetic orientation, becoming permanent magnets. Magnetism is also the property of a substance that has had its molecules magnetically oriented.
- magnetomotive force** — *See* electromotive force.
- magnetron**—*See* tube, magnetron.
- major lobe**—*See* lobe.
- man-made interference** — *See* interference, man-made.
- marine band**—*See* band, marine.
- marker, absorption**—A sharp dip in a frequency-response curve due to energy being absorbed by another circuit tuned sharply to the frequency at which the dip occurs.
- marking wave**—*See* wave, keying.
- mast**—A wooden or metal pole on which an antenna is mounted. It may consist of a single length of hollow tubing or several sections of tubing in a telescopic arrangement.
- master control board**—The key control board, or panel, from which a station is operated. Usually a remote-control panel containing the switches, gain controls, meters, etc. necessary for controlling transmitter and receiver operation.
- master oscillator**—*See* oscillator, master.
- matching stub**—*See* impedance-matching stub.
- matching transformer** — *See* impedance-matching transformer.
- maximum-rated carrier power** —*See* carrier power, maximum rated.
- maximum undistorted output** —*See* undistorted output, maximum.

**maximum usable frequency**—  
See frequency, maximum usable.

**Mayday** — The international distress signal used in radiotelephone communications. From the French word *M'aidez* meaning "help me." The counterpart of SOS, which is the international distress signal in radiotelephone communications.

**mc**—Abbreviation for megacycle (1,000,000 cycles).

**mcw**—Abbreviation. See modulated continuous waves.

**mean carrier frequency**—See carrier frequency, mean.

**mega**—Prefix denoting million.

**megacycle (mc)** — 1,000,000 cycles.

**mercury - vapor tube** — See tube, mercury vapor.

**meter**—(1) A unit of measurement in the metric system equal to 39.37 inches. A common unit of measurement for wavelength. (2) Also an instrument with a calibrated scale used for electrical or electronic measurements. (See specific type of meter.)

**meter, absorption frequency**—  
A meter designed to measure frequency by absorbing energy from the source being measured. Its basic operation depends on a tuned circuit or cavity which is loosely coupled to the source.

Maximum energy is absorbed from the source, as indicated by a meter or other device, when the meter is adjusted to resonance with the signal in question. The frequency can then be determined by reference to a calibrated dial on the meter or to a chart.

**meter, db**—A meter having a scale calibrated directly in decibels and designed to measure db values at a specific reference level (generally 1 milliwatt equals 0 decibels).

**meter, field-strength**—An instrument designed to receive a radio wave and indicate the strength of the signal existing at the antenna.

**meter, Frahm frequency**—A series of steel reeds, each tuned to a slightly different frequency and driven by an electromagnet. The frequency is indicated by the difference in amplitude of the reed vibration. These meters are designed to operate over a narrow frequency range and are usually used to monitor a particular frequency.

**meter, frequency**—An instrument that is designed to provide an indication of the frequency of a wave, a sound, a rotating device, an oscillator, a vibration, etc. (Also see specific type.)

**meter, heterodyne frequency**

—A frequency indicating instrument containing a frequency generator that is tuned to beat or heterodyne with the unknown frequency. At zero beat the generator frequency and the unknown frequency are the same.

**meter, VU**—A meter that is designed to indicate the level of a signal in volume units.

**meter, S**—A signal-strength meter. A meter and in some cases the associated circuits used to indicate the strength of a received signal.

**mev**—Abbreviation for million electron volts.

**mf**—medium frequency; sometimes used to denote microfarad.

**mfd**—Abbreviation for microfarad.

**mho**—The unit of conductance equal to the reciprocal of the unit of resistance (ohm).

**mic.**—Abbreviation for microphone.

**micro**—Prefix denoting one-millionth of something. For example, microvolt, microampere, microfarad, etc.

**micromicro**—Prefix denoting one millionth of one-one-millionth. One micromicrofarad equals  $10^{-12}$  farads.

**micron**—A unit used in the measure of very low pres-

ures. Also a unit of length equal to  $10^{-6}$  meter.

**microphone** — A transducer that converts mechanical energy into electrical energy. A device commonly used in radiocommunications to convert sound, such as the human voice, into equivalent electrical impulses. (*Also see specific type.*)

**microphone, antinoise**—A microphone designed to accept desired signals but discriminate against unwanted background noise. Examples are lip and throat microphones.

**microphone, astatic**—A microphone with omnidirectional characteristics.

**microphone, barium titanate**—A microphone that uses a barium titanate material to convert sound energy into electrical energy.

**microphone, bidirectional**—A microphone that is responsive in two opposite directions, having a pattern similar to a figure eight.

**microphone, capacitor**—A microphone consisting essentially of a rigid metal plate and a flexible diaphragm which form an air capacitor. Sounds entering the microphone cause the diaphragm to vibrate, producing corresponding variations in capacitance which are then

converted into audio-frequency signals by a suitable amplifier.

**microphone, carbon** — A microphone consisting primarily of a flexible diaphragm that is connected to a container or button filled with carbon granules. Movement of the diaphragm applies a varying pressure to the granules, causing the resistance of the carbon granules and hence the current through them to vary in accordance with the movement.

**microphone, cardioid**—A microphone having a heart-shaped response pattern. It has nearly equal response for approximately 180° in one direction and practically no response in the opposite direction.

**microphone, ceramic**—A microphone that uses a ceramic slab as the voltage-generating element. Except for the ceramic element, operation is similar to a crystal microphone.

**microphone, contact**—A microphone designed to pick up mechanical vibrations directly and convert them to electrical impulses. A throat microphone is one example.

**microphone, controlled-reluctance** — *See* microphone, reluctance.

**microphone, crystal** — Also

called piezoelectric microphone. A microphone that uses a material (usually crystalline) with piezoelectric properties to produce an electrical current that corresponds to sounds entering the device. Physical movement of a piezoelectric material produces a voltage, the value of which is dependent, in part, on the degree of movement. Crystal microphones have relatively high output, even for small vibrations.

**microphone, directional** — A microphone having a response pattern that permits maximum sound pickup in one or more directions, but not in all directions.

**microphone, dynamic**—A microphone that uses a moving coil and a permanent magnet as its voltage producing elements. The coil is attached to a flexible diaphragm, thus permitting it to move back and forth in the magnetic field in step with sound vibrations. This movement induces an audio current in the moving coil.

**microphone, eight-ball** — A nondirectional microphone having a shape like a ball.

**microphone, omnidirectional**— A microphone that exhibits an equal response to sounds from any direction while its position remains constant.

**microphone, reluctance** — A microphone whose operation is dependent on the reluctance of a magnetic circuit. Two basic types are the controlled-reluctance and variable-reluctance microphones.

**microphone, variable - reluctance**—*See* microphone, reluctance.

**microphonic** — A condition whereby the physical movement of a radio component causes variations in circuit current.

**microwave** — An electromagnetic wave whose length is less than 1 meter (39.37 inches).

**mike**—Short for microphone.

**milli** — Prefix for one one-thousandth e.g., milliamperere, milliwatt, etc.

**minor lobe**—*See* lobe.

**mixer** — In superheterodyne circuits, the stage where the incoming signal is beat with a signal from a local oscillator to produce a third signal known as the intermediate frequency. Also a device used in broadcasting and sound-recording and reproduction systems. It has two or more inputs and a common output. The mixer combines the input signals in the desired proportion to produce the output signal.

**mixer, crystal** — *See* crystal mixer.

**mks**—Abbreviation for meter-kilogram-second. A system for measuring units based on length, mass, and time. A system of mechanical unit.

**mksa** — A b b r e v i a t i o n for meter-kilogram-second-ampere. A system for measuring units based on length, mass, time, and the absolute ampere. A system of electrical unit.

**mmf**—Abbreviation for micromicrofarad.

**MO**—Abbreviation for master oscillator. *See* oscillator, master.

**mobile radio**—Term applied to radio equipment intended for use while in motion or during halts at unspecified points. Equipment used in vehicular installations is one example, and in some instances the term mobile is used to include hand-carried or pack-carried portable radio equipment.

**mobile receiver** — *See* receiver, mobile.

**mobile station** — *See* station, mobile.

**mod**—Abbreviation for modulation, modulator, or modulated.

**mode** — A particular method of operation, i.e., a two-way radio has two modes of operation—transmitting mode and receiving mode.

**modulate**—A process whereby



the phase, amplitude, or frequency of a signal is varied.

**modulated continuous wave (mcw)**—A radio transmission in which the carrier is transmitted at all times. The standard broadcast transmission is a modulated continuous wave.

**modulated wave** — *See* wave, modulated.

**modulating signal**—Any signal or waveform that is impressed on a carrier.

**modulation** — A process or final result of causing one or more of the characteristics of a wave to change in accordance with the variations of another wave. The impressing of intelligence on a carrier by changing its amplitude, frequency, or phase.

**modulation, absorption**—Modulation that is produced by changing, at the modulating frequency, the amount of energy absorbed by an impedance device.

**modulation, amplitude**—A variation in the amplitude of a wave that corresponds to the amplitude variations of the modulating signal. The modulation of an RF carrier by an audio signal in which the amplitude variations of the carrier correspond to the variation of the audio signal.

**modulation, angle**—A modu-

lation system in which the carrier phase angle is proportional to the amplitude of the modulating signal. Frequency and phase modulation are examples of angle modulation.

**modulation capability** — The maximum percentage of transmitter modulation that is possible without producing undue amounts of distortion. It should be close to 100% if the most effective transmitted signal is to be obtained.

**modulation, cathode**—A system of modulation in which the modulating signal is applied to the cathode circuit.

**modulation, constant-current** — Also called plate, and Heising modulation. Modulation in which the modulating voltage is superimposed on the DC plate-supply voltage to the RF amplifier. This is usually accomplished by supplying the power to the RF amplifier through the secondary of a modulation transformer. The RF signal will have an amplitude that is proportional to the sum of the DC voltage and the modulating voltage.

**modulation, controlled-carrier** — A method of increasing the RF amplifier plate efficiency by controlling the DC power to the modulated stage in direct relation to

the average amplitude of the modulating signal. The carrier power is continually adjusted to maintain a high percentage of modulation, but not in excess of 100%.

**modulation, cross**—*See* cross modulation.

**modulation deviation** — The amount of deviation an RF carrier undergoes during the process of modulation. (*Also see* phase and frequency deviation.)

**modulation, double**—A modulation system in which the carrier is modulated by a sub-carrier that is, in turn, modulated by the intelligence signal. Such systems are often used in multiplex transmission.

**modulation, double - sideband** —The standard system of radio transmission in which two sidebands, upper and lower, are transmitted. The carrier in DSB transmissions may be transmitted normally, partially, or completely suppressed.

**modulation, downward** — The modulation direction that cuts off the carrier. Since it is impossible to attain less than zero current, the maximum percentage of downward modulation can never exceed 100%. (*Also see* modulation, upward.)

**modulation envelope** — A graphic representation of

the instantaneous values of all of the frequencies that make up the modulated wave. The amplitude variations of an AM wave follow the amplitude variations of the modulating signal.

**modulation factor**—For an amplitude-modulated wave it is the ratio of the difference between the unmodulated carrier amplitude and minimum or maximum carrier amplitudes to the amplitude of the unmodulated carrier.

The amplitude is the total swing of the RF sine wave measured from peak to peak.

**modulation, frequency (FM)** —A type of modulation in which the amount of carrier deviation is proportional to the amplitude of the modulating signal, and the rate of carrier deviation is equal to the modulating frequency.

**modulation, grid**—A method of modulation in which the modulating signal is applied to one of the grids of the RF amplifier.

**modulation, Heising** — *See* modulation, constant-current.

**modulation, high-level** — A modulation system that employs a modulating power nearly equal to the output power of the transmitter. Plate modulation is of this

type.

**modulation, hum**—The modulation of a signal by the 60-cycle line frequency or by the 120-cycle ripple frequency.

**modulation, inductance-tube**—*See* modulator, reactance tube.

**modulation, light**—A system that employs the Kerr-cell effect to obtain modulation of a light beam for communications purposes.

**modulation, low-level**—Modulation that is added to the carrier before the carrier is amplified to its final value.

**modulation monitor** — *See* monitor, modulation.

**modulation percentage**—The modulation factor expressed as a percentage. The modulation factor multiplied by 100.

**modulation, phase**—A modulation system in which the phase of a carrier is caused to shift in proportion to the amplitude of a modulating signal.

**modulation, plate**—*See* modulation, constant-current.

**modulation, pulse**—The modulation of a carrier by pulses or the changing of one or more characteristics of a pulse train, such as amplitude position, or shape.

**modulation, pulse-amplitude**—A modulation system in which the information is

transmitted by varying the amplitude of the pulses.

**modulation, pulse-duration** — A pulse modulation system in which the duration or width of the individual pulses is changed by the modulating signal.

**modulation, pulse-frequency**—A pulse modulation system in which the frequency or pulse ratio is proportional to the modulating signal.

**modulation, pulse-interval** — A modulation system in which the information causes a change in the interval or spacing between pulses.

**modulation, pulse-length**—*See* modulation, pulse-duration.

**modulation, pulse-position**—A pulse modulation system in which the pulse rate is constant, but the position of each pulse is advanced or retarded in accordance with a modulating signal.

**modulation, pulse-time** — A pulse modulation system in which the time of occurrence of a pulse characteristic is changed in accordance with the modulating signal.

**modulation, pulse-width**—*See* modulation, pulse-duration.

**modulation, reactance**—A system of modulation in which a reactance is changed in proportion to the amplitude of a modulating signal.

(Also see modulator, reactance-tube.)

**modulation, screen-grid** —

A modulation system in which the modulating signal is applied to the screen grid of a tube.

**modulation, single-sideband**—

A method of producing a modulated carrier wave having only one of the two sidebands and a carrier that is partially or completely suppressed.

**modulation, upward**—The direction of modulation that increases carrier amplitude. Since there is no limit to the amplitude that a carrier can reach, it stands to reason that the limit to upward modulation, is the power capability of the modulating system. (Also see modulation, downward.)

**modulation, variable-carrier**—  
See modulation, controlled-carrier.

**modulator**—The circuit, device, tube, or complete unit that performs the function of adding modulation to a wave.

**modulator, balanced**—A device or circuit, usually a push-pull amplifier into which a carrier and a modulating signal are introduced to produce an output consisting of just the upper and lower sidebands, the carrier being cancelled out or sup-

pressed.

**modulator, reactance-tube**—A tube that is so arranged that an alternating voltage applied to the plate and cathode will result in a plate current that is in quadrature with the plate-to-cathode voltage. The tube acts as an inductive or capacitive reactance to alternating voltages applied to the plate and cathode.

**modulation, rectifier**—A modulator that employs diodes as the nonlinear element in a modulation system. This low-efficiency modulator is sometimes used in suppressed-carrier modulation systems.

**monitor**—Any device used to provide a visual or aural indication of the condition or change in condition of signals, voltages, or circuit parameters.

**monitor, modulation**—Any device that is employed at the transmitter to indicate the percentage of carrier modulation. The monitor may be a simple meter, oscilloscope, or electron-ray tuning indicator.

**monkey chatter**—A term used to describe the muffled speech or other intelligence accompanying a desired signal when the letter beats with the sidebands of an adjacent-channel station.

**monostable multivibrator** —  
See multivibrator, monostable.

**MOPA**—Abbreviation for master-oscillator power amplifier.

**Morse code** — A code system whereby the alphabet, numerals, and punctuation are represented by a series of dots and dashes. (*Also see specific Morse code.*)

**Morse code, American**—The original code consisting of dots and dashes, devised by Samuel F. B. Morse. Used primarily in wire telegraphy by railroads.

**Morse code, Continental**—See Morse code, International.

**Morse code, International**—A code system whereby the alphabet, numbers, and punctuation are represented by combinations of dots and dashes. Differing in eleven characters, it is derived from the original American Morse code introduced by Samuel F. B. Morse. The International Morse code, also called Continental code or Continental Morse code, is used worldwide for radiotelegraph communications.

**motorboating**—A low-frequency audio oscillation that resembles the sound of a motorboat.

**moving-coil microphone**—See microphone, dynamic.

**mu factor (vacuum tube)**—  
The ratio of the change in the voltage of one electrode when the voltage and current of the other tube electrodes are held constant.

**multiband antenna**—See antenna, multiband.

**multiband transmitter**—See transmitter, multiband.

**multichannel transmitter**—  
See transmitter, multiband.

**multihop**—A condition whereby radio waves entering the ionosphere are bent back to earth and from here are reflected back into the ionosphere and again back to earth. This phenomenon, which may occur several times, makes world-wide radiocommunications possible. Also called multiskip.

**multipath reception**—See reception, multipath.

**multiplex transmission** — A method of transmitting two or more signals on a single, or common, carrier.

**multiplier, frequency**—See frequency multiplier.

**multivibrator**—A group of oscillators that employ two amplifying units that are connected so as to cause the output of the second stage to be fed back to the first with a phase relation that will cause the stages to oscillate. *See specific type.*

**multivibrator, astable**—A multivibrator that requires no

external signal for operation and generates a continuous waveform.

**multivibrator, bistable** — A multivibrator that has two stable states and must be externally triggered from one state to the other. Also called Eccles-Jordan and flip-flop.

**multivibrator, cathode-coupled** — A multivibrator that employs a common-cathode resistor to provide coupling between the two stages..

**multivibrator, free-running** — See multivibrator, astable.

**multivibrator, monostable** — A multivibrator that has one stable state. When the monostable multivibrator is triggered, it changes to the unstable state and then reverts back to the stable state.

**multivibrator, one-shot** — See multivibrator, monostable.

**multivibrator, regenerative-bistable** — A multivibrator

that has two stable states, each of which depends on each of which depends on the input voltage level. forms, pulse shaping, DC level detection, and pulse equalization.

**mu-metal** — One of a group of nickle-iron alloys that has an extremely high permeability at low flux densities. Used as a magnetic shielding around cathode-ray tubes, magnetic-phono and -tape pickups and circuits or devices that can be affected by relatively weak magnetic fields.

**murray loop** — A wheatstone-bridge type of circuit employed to localize a grounding defect in a communications line or cable.

**mutual conductance** — See transconductance.

**mv** — Abbreviation for millivolts.

**mw** — Abbreviation for milliwatts.



## N

**NARTB** — Abbreviation. *See* National Association of Radio and Television Broadcasters.

**National Electrical code** — A set of rules and standards set forth by the National Board of Fire Underwriters governing the construction and installation of electrical equipment.

**National Electrical Manufacturers Association (NEMA)** — An organization comprised of representatives of companies that manufacture electrical products.

**natural frequency** — *See* frequency, natural.

**NC**—Abbreviation for no connection. Used quite often on schematic diagrams and vacuum-tube symbols.

**NEMA** — Abbreviation. *See* National Electrical Manufacturers Association.

**neon**—An inert gas used in various tubes and lamps. When ionized, neon gas exhibits a reddish-orange glow.

**neon lamp**—*See* lamp, neon.

**neon oscillator**—*See* oscillator, neon.

**neper**—The basic division of a logarithmic scale for expressing the ratio between two voltages, currents, or powers. One neper equals 0.8686 bels, or 8.686 deci-

bels.

**network**—A combination of two or more electrical components arranged to perform a specific function. (*Also see* specific type.)

**network, all-pass**—A network designed to provide decay or phase shift but exhibits a flat response to all frequencies.

**network, de-emphasis**—A selected combination of electrical components arranged in such a way as to reduce some parts of a signal. For example, the restoration of a pre-emphasized signal to its original form. (*Also see* network, pre-emphasis.)

**network, differentiating** — A network of electrical components in which the voltage amplitude at the output is proportional at any instant to the rate of change of voltage amplitude at the input. Also called high-pass filter network.

**network, isolation**—A network that is inserted in a transmission line or between components or circuits to prevent interaction between the points of insertion.

**network, pre-emphasis** — A network of components designed to augment a signal or certain frequencies within a signal. Usually used

to overcome certain deficiencies in preceding stages. In FM transmission, for example, certain frequencies are pre-emphasized at the transmitter and subsequently de-emphasized at the receiver. (*Also see* network, de-emphasis.)

**neutralization**—Counteracting the effects of feedback in an amplifier stage by introducing a signal at the input that is  $180^\circ$  out of phase and equal in amplitude to the feedback signal. To neutralize the effects of inter-electrode capacity.

**neutralization, cross** — *See* cross neutralization.

**neutron** — One of the three basic particles of an atom. It is electrically neutral and has approximately the same mass as the proton.

**Nical prism** — A device used to produce plane-polarized light and is used in conjunction with the Kerr cell as a light modulator.

**nodal-point keying**—*See* keying, nodal-point.

**node**—In a standing wave, any line, point, or surface that has zero amplitude. Also called branch point, junction point, or vertex.

**node, current** — Any point along an antenna, transmission line, or other device having standing waves where the current is zero.

**node, voltage**—Any point in a stationary-wave system where there is zero voltage.

**noise, atmospheric**—Electrical disturbances produced in the atmosphere that introduce unwanted sounds into communications transmissions. (*Also see* interference, atmospheric.)

**noise-canceling microphone**—*See* microphone, antinoise.

**noise, converter**—*See* converter noise.

**noise, electrical** — Disagreeable and unwanted sounds that are present in the background of electronically reproduced sounds. Contributing factors are thermal, shot, ignition, and atmospheric noises. (*Also see* interference.)

**noise, engine** — *See* engine noise.

**noise figure**—For an electrical device, a measure of the noise present in the output that is in excess of the noise that would be produced by a theoretically perfect device.

**noise filter**—*See* filter, noise.

**noise generator** — A device used for the specific purpose of generating noise, e.g., noise diodes and gas discharge tubes. One special generator contains a square-wave oscillator that is rich in all of the higher harmonics. It can be used to check

- receivers, audio and tuned circuits such as noise limiters and delay networks.
- noise, ignition**—*See* interference, ignition.
- noise, impulse**—Noise that occurs at various intervals. Can usually be attributed to on-off operation of an electrical device.
- noise limiter**—A circuit that reduces the amplitude of noise pulses by clipping them at a level slightly above the signal level.
- noise, line**—Noise that is present on any power or transmission line. Refers mainly to noises that are generated by equipment operating on a line that is picked up by the line and appears at other points as an undesirable interference.
- noise-operated squelch** — *See* squelch, noise-operated.
- noise, shot** — Noise produced by the random movement of electrons in a vacuum tube.
- noise, static**—Noise produced by electrical disturbances in the atmosphere. Usually refers to the sounds produced by electrical discharges in the atmosphere.
- noise, thermal**—Noise that is generated by the agitation of electrons in a conductor.
- noninductive capacitor** — *See* capacitor, noninductive.
- noninductive resistor**—A resistor that is designed to have a minimum inductive effect on a circuit. Most carbon and metal film resistors are noninductive. Wire wound resistors can also be used to cancel the inductive effect.
- noninductive winding** — A winding that is reversed in a manner that cancels the inductance.
- nonlinear amplification** — *See* amplification, nonlinear.
- nonresonant line** — *See* line, transmission.
- notch filter**—*See* filter, notch.
- null**—No effect, zero, having no value, giving no reading. Used in bridge measurements to indicate a balance or null.
- null indicator**—*See* indicator, null.



**oblique-incidence transmission**

—Transmission of radio signals by reflection from the ionosphere.

**octode, tube** — *See* tube, octode.

**ohm**—The electrical unit of resistance. The value of resistance through which a potential difference of 1 volt will maintain a current of 1 ampere.

**ohmmeter**—An instrument used to measure resistance. It employs a direct-reading scale that is generally calibrated in ohms, megohms, or both.

**omnidirectional**—Term meaning all directions. Used primarily in connection with the response patterns of microphones, antennas, etc.

**omnigraph** — A device that produces messages in Morse code. Used primarily for code instruction, it incorporates a buzzer which is actuated by a perforated paper tape.

**one-shot multivibrator** — *See* multivibrator, monostable.

**open-wire transmission line**—*See* transmission line, open-wire.

**operating power**—The amount of RF power actually delivered to the antenna terminals.

**operation, break-in** — *See*

keying, break-in.

**ordinary wave**—*See* wave, ordinary.

**oscillation, parasitic**—An undesired form of self-sustained oscillation or transient impulse. Parasitic oscillation can also occur at a given instant within a desired oscillation.

**oscillator**—An amplifier that has an input supplied by its own output. An amplifying circuit designed to produce an AC output at a frequency determined by its own circuit parameters. *See* specific type.

**oscillator, all-wave**—*See* signal generator, all-wave.

**oscillator, audio** — An oscillator that produces an AC output frequency between 20 and 20,000 cycles. Also includes test instruments designed to develop frequencies from zero to about 100,000 cycles.

**oscillator, Barkhausen-Kurz**—An oscillator that depends on the velocity and transit time of electrons within a tube. A triode operated with the grid more positive than the plate.

**oscillator, beat-frequency**—An oscillator that is used in a receiver to beat with the incoming signal to provide heterodyne reception. An

oscillator employed to receive code or suppressed-carrier transmissions.

**oscillator, blocking**—A relaxation oscillator that blocks itself after each oscillation. A pulse, transformer coupled from plate to grid, draws grid current and charges a capacitor that cuts off the tube. The discharge time for the capacitor and the resonance of the transformer determines the frequency of the oscillator.

**oscillator, Clapp** — A series-tuned Colpitts oscillator in which the tube is loosely coupled to the tuned circuit, tube capacitances are shunted by large capacitors, and the tuned circuit is designed with a high L to C ratio, creating a circuit that has lower frequency-drift characteristics.

**oscillator, coherent**—An oscillator that produces a wave output that has definite voltage, current, and phase relations between individual wave elements.

**oscillator, Colpitts**—An oscillator having a tank circuit connected between the plate and grid and tuned with two series capacitors. The center tap of the capacitors is connected to the cathode to provide a signal feedback of the proper phase to sustain oscillation.

**oscillator, concentric-line**—An oscillator that employs a section of concentric or coaxial line. It provides a high Q with a minimum of undesired radiation.

**oscillator, crystal-controlled**—An oscillator that is frequency-controlled by the electromechanical vibration of a quartz crystal.

**oscillator, dynatron** — A screen-grid tube operated as an oscillator by using the negative-resistance effect produced when the plate is operated at a lower potential than the screen grid. Secondary electrons knocked from the plate cause a reverse current to flow in the plate circuit.

**oscillator, electron-coupled** — An oscillator employing two grids and the cathode of a tube as an oscillator and having the plate circuit coupled to this oscillator through the electron stream. Output signal is extracted from the plate circuit; output-loading changes do not affect the oscillator frequency.

**oscillator, free-running** — An oscillator that functions independently of any external signal. The frequency is determined entirely by the circuit parameters.

**oscillator, Gill-Morrel**—An oscillator that employs a com-

bination of the electron transit time through a tube and the circuit elements to develop extremely high frequencies.

**oscillator, grid-dip** — An instrument that employs an RF oscillator and a meter to indicate the absorption of energy from the oscillator tank circuit. This instrument is used to indicate the resonant frequency of a tuned circuit.

**oscillator, harmonic**—An oscillator that is designed to operate in a mode that will produce harmonics of the fundamental in the output circuit. Used when the fundamental oscillation cannot be attained, as in the case of crystal-controlled oscillators above about 100 mc.

**oscillator, Hartley**—An oscillator that has a tuned-tank circuit between the plate and grid with the inductor center-tapped and connected to the cathode to provide a feedback signal of the proper phase to sustain oscillation.

**oscillator, heterodyne**—The local oscillator in a superheterodyne receiver. The oscillator that generates the frequency used to heterodyne with the incoming frequency to produce the intermediate frequency.

**oscillator, line-stabilized**—An

oscillator that uses a section of parallel or coaxial line as the resonant-tank circuit. The high Q of the resonant line plus its mechanical rigidity tend to stabilize the frequency of the oscillator.

**oscillator, local**—*See* oscillator heterodyne.

**oscillator, master** — A highly stable frequency source that is isolated from any loading effects by driving the load with a power amplifier that is excited by the oscillator.

**oscillator, neon**—A relaxation type of oscillator in which a capacitor charges through a resistor and discharges through a neon glow lamp. The frequency is controlled by the RC time constant of the circuit.

**oscillator, phase-shift**—An oscillator in which 180° shift in the phase of the output signal is provided by a network placed between output and input of a single stage of amplification. In this type oscillator the amplification must be high enough to overcome network losses, or the oscillation will not be sustained.

**oscillator, Pierce**—One of the simplest of the crystal-controlled oscillators in which the crystal is connected between the grid and plate and the inter-electrode capacity between grid and



plate. The grid and cathode provide the voltage excitation for the oscillator. The arrangement is somewhat similar to the Colpitts oscillator.

**oscillator, pulsed**—An oscillator that periodically turns on and off, resulting in group or pulses of oscillator energy. The oscillator may be self-pulsed or turned on and off by externally applied pulses.

**oscillator radiation**—*See* radiation, oscillator.

**oscillator, RC** — An oscillator in which the period of a cycle is determined by the charge or discharge of a capacitor through a resistance. A form of relaxation oscillator.

**oscillator, relaxation**—An oscillator that depends, for its operation, on the charge and discharge of a capacitor or inductor through a resistance. These oscillators include such types as multivibrators and blocking oscillators.

**oscillator, resonant-line** — An oscillator that employs a length or lengths of conductor as the resonant circuit to control the frequency of an oscillator. (*Also see* oscillator, line-stabilized.)

**oscillator, ring**—A number of amplifiers connected in cascade, with the last stage

connected to the first to complete a ring. It is signal-phased so that the entire arrangement oscillates. The push-pull oscillator is a two-stage ring oscillator.

**oscillator, squegging** — *See* blocking oscillator.

**oscillator, tri-tet**—A crystal-controlled oscillator in which the screen grid is used as the plate of a triode oscillator. The output of a tri-tet oscillator can be tuned to a multiple of the crystal frequency and used for harmonic operation.

**oscillator, tuned-grid**—An oscillator that contains a tuned resonant tank in the grid circuit to control the frequency.

**oscillator, tuned-grid tuned-plate** — An oscillator that has tuned circuits in both the grid and plate circuits. Depends on the interelectrode capacity of the tube for the feedback path.

**oscillator, tuned-plate**—An oscillator stage that incorporates a resonant circuit in its plate circuit.

**oscillator, variable-frequency** — Any oscillator designed so that the frequency of oscillations can be varied over a given range.

**oscillator, Wien-bridge** — An oscillator that incorporates a Wien-bridge arrangement to control the phase and

amount of feedback that occurs from output to input of a two-stage amplifier.

**oscilloscope**—An electronic instrument designed to provide a visible indication of voltage or current waveforms for the purpose of measurements or analysis.

**oscilloscope, cathode-ray**—*See* cathode-ray oscilloscope.

**overload relay**—*See* relay, overload.

**overmodulation**—A condition where modulation is in ex-

cess of 100%. This condition results in distortion of the modulated wave due to the carrier being cut off during portions of the modulating cycle. Also produces a form of interference referred to as splatter.

**over-the-horizon transmission**—*See* scatter propagation.

**overtone**—A harmonic of a fundamental frequency or tone.

**overtone crystal**—*See* crystal, overtone.

## P

**PA**—Abbreviation. *See* power amplifier.

**pad**—An attenuator network that is designed to present a constant load impedance across the line. Fixed pads have fixed values of attenuation. Adjustable pads are designed to maintain a constant load impedance while permitting the attenuation to be changed.

**padder**—A trimmer capacitor connected in series with the oscillator tuning circuit of some superheterodyne receivers to permit oscillator tracking at the low end of the tuning range.

**PAM**—Abbreviation for pulse amplitude modulation. *See* modulation, pulse amplitude.

**panoramic receiver**—*See* receiver, panoramic.

**parabolic antenna**—*See* antenna, parabolic.

**paramagnetic**—Pertaining to a material having, or capable of having, a magnetic permeability greater than that of a vacuum but less than the permeability of a ferromagnetic material.

**parameter** — A quantity to which an arbitrary value may be assigned to find other variables. A value or group of values that are used to determine the performance of a device. A

quantity or value that changes in relation to how it is used.

**paraphase** — *See* inverter, phase.

**parasitic choke**—*See* choke, parasitic.

**parasitic element, antenna**—*See* antenna parasitic element.

**parasitic oscillation**—*See* oscillation, parasitic.

**parasitic suppressor**—*See* suppressor, parasitic.

**passband**—The difference between the upper and lower limits of frequencies that will pass through a circuit or device without experiencing appreciable attenuation. (*Also see* bandpass.)

**passband filter** — *See* filter, passband.

**patchboard**—A board or panel containing a number of single or double jacks at which circuits may be terminated. Interconnection between these jacks are made with patchcords.

**patchcord**—A flexible conductor terminated at both ends with plugs, used for interconnecting circuits on a patchboard.

**patch panel**—*See* patchboard.

**pattern**—*See* specific type.

**PDM**—Abbreviation for pulse-duration modulation. *See* modulation, pulse-duration.

- peak**—The maximum instantaneous value of a varying current or voltage. Also called crest.
- peak-to-peak**—The difference between the maximum and minimum values of an alternating wave.
- penetration frequency** — *See* frequency, penetration.
- pentagrid converter**—*See* tube, pentagrid-converter.
- pentode**—*See* tube, pentode.
- percentage of modulation**—*See* modulation percentage.
- permanent magnet (PM)**—A hardened material, such as iron or steel, which has been magnetized and is capable of retaining the magnetic characteristics indefinitely.
- permeability tuning**—A method of tuning whereby the inductance of a coil is varied by moving a powered-iron core in and out of the coil form.
- PFM**—Abbreviation for pulse-frequency modulation. *See* modulation, pulse-frequency.
- phantastron**—A form of sawtooth generator that requires a triggering pulse to initiate each cycle of operation.
- phase angle**—The time interval between two values or positions that are functions of a cyclic change. Usually stated in degrees or radians.
- phase detector**—*See* detector, phase.
- phase deviation**—In a phase- or frequency-modulating system it is the difference between the angle of the modulated wave and the reference angle of the carrier.
- phase difference**—*See* phase angle.
- phase distortion**—*See* distortion, phase.
- phase inverter**—*See* inverter, phase.
- phase modulation**—*See* modulation, phase.
- phase-shift oscillator**—*See* oscillator, phase-shift.
- phon**—The unit denoting loudness level. Sometimes used in place of the decibel.
- photocell**—*See* photoelectric cell.
- photoconductive cell**—A type of light-sensitive cell that acts as a variable resistance, the value of which is dependent on the degree of light to which it is exposed. Its ability to conduct corresponds to the amount of light.
- photoelectric cell**—A light-sensitive cell that converts light variations into corresponding variations of voltage or current. Three basic types are the photovoltaic, photoemissive, and photoconductive cells.

**photoemissive cell** — A light-sensitive cell that emits electrons when exposed to light. The amount of electron flow it produces corresponds to the intensity of the light hitting it.

**photovoltaic cell**—A type of photoelectric, or light-sensitive, cell that produces a voltage when exposed to light. The magnitude of the voltage varies with the intensity of the light to which it is subjected.

**Pierce oscillator**—*See* oscillator, Pierce.

**pi filter**—*See* filter, pi.

**plane of polarization** — A plane parallel to the lines of force in the electric field of a wavefront. In a vertically polarized radio wave the E plane is perpendicular to the surface of the earth; in a horizontally polarized wavefront the E plane is parallel to the surface of the earth.

**plate detection**—*See* detection, plate.

**plate dissipation** — Power losses radiated as heat from the plate, or anode, of a vacuum tube. The plate dissipation rating of a tube (usually expressed in watts) is a rating of the ability of the tube to dissipate heat from the anode.

**plate keying** — *See* keying, plate.

**plate modulation**—*See* modulation, constant-current.

**plate power input**—In a radio transmitter, the product of the plate voltage and plate current in the final RF stage with no modulation applied.

**plate saturation**—A condition whereby increasing the plate voltage on a vacuum tube no longer causes an increase in plate current.

**PLM**—Abbreviation for pulse-length modulation. *See* modulation, pulse-length.

**PM**—(1) Abbreviation for permanent magnet. (2) Abbreviation for phase modulation. *See* modulation, phase.

**polarity** — A distinguishing feature of an object or energy that is characterized by having two opposite or contrary qualities, e.g., north and south poles of magnets, positive and negative charges.

**polarization** — Orientation with respect to a given position, force, voltage, direction, etc. *See* specific application.

**polarized relay** — *See* relay, polarized.

**portable** — Capable of being easily carried. This is extended to mobile equipment; while not capable of being carried by an individual, it is portable on a truck or mobile carrier.

**portable station**—*See* station, portable.

**positive grid oscillator**—*See* Barkenhausen-Kurz oscillator.

**potential, contact** — *See* voltage contact.

**potential (electrical)**—Voltage or electrical pressure. Energy available to move an electric current.

**potentiometer**—An instrument used to measure small voltages, but more commonly used to describe a three-terminal variable resistor of the type used for volume, tone, etc. controls in electronic equipment.

**power**—The amount of work per unit of time. Usually expressed as watts and is equal to  $I^2R$ ,  $EI$ , or 1 joule per second. *See* specific reference.

**power amplifier**—The final or last stage in a series of amplifiers. An amplifier that delivers power as compared to a signal or voltage amplifier.

**power gain**—The ratio of the amount of power delivered from a device. Ratio of output-to-input power usually expressed in decibels.

**power, level**—The amount of power contained in a system. A ratio of the power at some point in a system to a reference power level, often expressed in decibels.

**power loss**—A ratio of the total power delivered to a cir-

cuit or device to the power delivered by that device to a load.

**power pack**—A unit consisting of batteries or transformers, rectifier, and filters necessary to completely power a particular electronic device. (*Also see* specific type.)

**power pack, AB**—A power source for filament- and plate-supply voltages.

**power supply**—*See* supply, power.

**PPM**—Abbreviation for pulse-position modulation. *See* modulation, pulse-position.

**preamplifier**—A voltage amplifier, consisting of one or more stages of amplification that is used to increase a weak signal to a level that can be handled by another amplifier. Many amplifiers are designed to accept a given signal level at one impedance and to have a particular frequency response. A preamplifier is any amplifier used to change the characteristics of a signal so that it will match the input of such an amplifier.

**preamplifier (antenna)** — An RF amplifier that is inserted between the antenna and a radio or television receiver to increase the signal to a useful level. Also called booster.

**pre-emphasis network** — *See*



network, pre-emphasis.

**preselector**—A selective network or preamplifier used ahead of a receiver to provide improved selectivity and sensitivity. (*Also see preamplifier.*)

**primary cell**—*See* cell, primary.

**primary winding**—*See* winding, primary.

**printed circuit**—An electrical circuit, composed primarily of the interconnecting conductors, that is printed, etched, painted, etc., on an insulating surface in a manner that resembles printing.

**product detector**—*See* detector, product.

**propagation**—The movement of wave energy through a transmitting medium; e.g., light propagates through space.

**propagation constant**—A characteristic of a transmission line or medium through which wave energy propagates. It indicates the effect the medium will have on the wave.

**propagation velocity** — The speed with which wave energy proceeds through a medium.

**PRR**—Abbreviation for pulse repetition-rate.

**PTM**—Abbreviation for pulse-time modulation. *See* modulation, pulse-time.

**PTT**—Abbreviation for push-

to-talk.

**public safety band**—*See* band, public safety.

**pulsating current**—An undirectional electric current whose rate of flow fluctuates periodically between two values. A direct current that changes value at a regular interval. Also called pulsating DC.

**pulse**—A current or voltage that changes abruptly from one value to another and back to the original value in a finite length of time. Used to describe one particular variation in a series of wave motions.

**pulse-duration modulation (PDM)** — *See* modulation, pulse-duration.

**pulse-frequency modulation (PFM)** — *See* modulation, pulse-frequency.

**pulse-interval modulation (PIM)** — *See* modulation, pulse-interval.

**pulse-length modulation (PLM)** — *See* modulation, pulse-duration.

**pulse modulation**—*See* modulation, pulse.

**pulsed oscillator**—*See* oscillator, pulsed.

**pulse-position modulation (PPM)** — *See* modulation, pulse-position.

**pulse-time modulation** — *See* modulation, pulse-time.

**pulse-width modulation** — *See* modulation, pulse-duration.

**push-pull circuit**—A symmetrical arrangement of two groups of circuit elements about a common reference, each operating  $180^\circ$  out of phase with the other and with the outputs combined

to form a common signal. Used extensively in the output stage of audio amplifiers.

**PWM** — Abbreviation for pulse-width modulation. *See* modulation, pulse-width.

## Q

**Q**—Symbol for quantity. Also quality factor (Q factor). The merit of a coil or capacitor; equal to its reactance divided by its resistance.

**quad antenna** — *See* antenna, cubical-quad.

**quadrature**—A 90° phase relation between two functions or positions. A 90° angle between two vectors.

**quarter-wave antenna** — *See* antenna, quarter-wave.

**quarter-wave line**—*See* quarter-wave stub.

**quarter-wave stub**—Used primarily to suppress even-order harmonics. A section of transmission line cut to a quarter wavelength of the fundamental frequency with the leads shorted together at one end. The open end presents a high impedance to the fundamental frequency and odd harmonics, but it effectively shorts out the even harmonics.

**quarter-wave termination** — A wave-guide termination comprised primarily of a wire grating and a metal plate separated by one-quarter wavelength. With this arrangement waves reflected from the metal plate are annulled by the wire grating, thereby effectively absorbing any energy that

would normally be reflected from the termination.

**quarter-wave support** — *See* insulator, metallic.

**quartz crystal** — *See* crystal, quartz.

**quiescent-carrier telephony** — A method of radiotelephone transmission in which the carrier is present only when accompanied by modulation.

**quiet hours**—A period of time designated by the Federal Communications Commission during which an amateur station is restricted from transmitting radio signals. Generally imposed on amateur operators which have failed to clear up the cause of broadcast or television interference for which their equipment is responsible.

**quieting**—The degree of noise reduction below the signal level in a radio receiver.

**quieting sensitivity**—*See* sensitivity, quieting.

**Q-multiplier**—A filter circuit designed to provide a sharp peak (increase in Q) at a particular frequency. Used in communications receivers when increased selectivity is desired.

**Q signals**—A system of prefixes, used primarily in amateur radio to minimize certain information. The sig-

nals consist of three or four letters in series, each beginning with the letter Q; i.e., QRT, QSO, QSY, etc. Although the Q signals were primarily intended to speed up radiotelegraphy operation, they have found wide usage in radiotelephony as well.

**QSL card** — A type of card used for verification of contacts between amateur radio stations. Each operator

sends the other a QSL card containing such information as the call letters, date and time of contact, frequency, type of emission, signal report, etc.

**quartz**—A crystalline mineral having piezoelectric properties. In its natural form it has a hexagonal cross section and is transparent. Most commonly used as the frequency-controlling element in oscillators.

## R

**R**—Symbol for resistor or resistance.

**RADAS** — Abbreviation. *See* Random - Access, Discrete-Addressing Systems.

**radian**—A unit of angular measurement. An angle that has its vertex at the center of any circle will intercept an arc whose length is equal to the radius of that circle.

**radiant energy**—(1) Energy in the form of electromagnetic waves. These forms include radio, heat, light, x-ray, cosmic ray, etc. (2) May also include any form of energy, such as sound and shock waves, that propagate through a medium as wave energy.

**radiating guide**—The portion of a wave-guide system that radiates energy into space.

**radiation**—Used to describe an energy form. The process by which energy is propagated through space. *See* specific type.

**radiation efficiency**—A ratio of the amount of power that is radiated to the amount of power that is supplied to the radiator.

**radiation, electromagnetic** — An energy form consisting of electromagnetic and electrostatic fields that propagate through space in a direction that is perpendicular

to the plane of the fields.

**radiation, oscillator** — Electromagnetic radiation from an RF oscillator. In many types of equipment the oscillator is thoroughly shielded to prevent this unwanted radiation.

**radiation pattern**—A graphical representation of the equal power point in the field of a radiator. Describes the radiation characteristics of an antenna.

**radiation pattern, free-space** —A radiation pattern that is taken at a point far enough from the radiator to avoid the irregularities caused by the antenna supporting structure, and ground effects.

**radiation resistance** — A resistance that, when placed in series with an antenna will dissipate the same quantity of power as the antenna radiates.

**radiation, spurious**—Any radiation from an electronic device that is undesirable; i.e., radiation from points other than the antenna and radiation at frequencies other than the assigned frequencies.

**radiator**—Any body that gives up energy in the form of radiation. More specifically it is the driven ele-

ment in an antenna array or a device used to dissipate heat from a tube, transistor, or other component. *See specific type.*

**radiator, horizontal** — The physical orientation of the driven element of an antenna. A radiator that emits a horizontally polarized wave.

**radiator, vertical** — The physical orientation of the driven element of an antenna. An antenna radiator that emits a vertically polarized wave.

**radiocommunication** — The transfer of information between two or more distant points by the transmission and reception of radio wave energy.

**radiocommunication circuit** — A radio contact that permits the exchange of information between two stations.

**radio direction finder (RDF)** — *See* direction finder, radio.

**radio fade-out** — The reduction in the level of a signal which is usually caused by changes in the atmosphere. Particularly noticeable when the signal is reflected from the E layer.

**radio field intensity** — *See* field strength.

**radio fix** — The determination of the direction from which a radio transmission is originating by employing a

radio direction finder.

**radio frequency (RF)** — The frequencies in the electromagnetic radiation spectrum that are used for radiocommunications.

**radio horizon** — The points at a distance from a transmitter where radiation travels tangential to the surface of the earth.

**radio link** — Two radio stations in contact with each other that are used to complete the contact between other stations. A radio relay station. The ship-to-shore radiocommunication that completes a telephone contact.

**radio range, visual** — *See* line of sight communications.

**radio receiver** — *See* receiver, radio.

**radio silence** — A period during which radio transmissions are suspended voluntarily, by agreement, or by law. For example, the radio silence observed by maritime stations to monitor the distress frequencies.

**radio spectrum** — The range of wavelengths below 3,000,000 mc that are used for radiocommunications.

**radio telegraphy** — A telegraphy system that employs radiocommunications techniques.

**radio transmitter** — *See* transmitter.

**radio-wave propagation** — *See*



- wave propagation.
- radio waves**—Electromagnetic waves of frequencies lower than 3,000,000 mc that are propagated in space without artificial guides.
- Random-Access, Discrete Addressing Systems (RADAS)** — A radiocommunications system in which the voice is transmitted over a very wideband channel and addressed to specific subscribers.
- range, frequency** — *See* frequency range.
- rated**—The voltage, current, or power a circuit or device will deliver under specific conditions.
- ratio detector**—*See* detector, ratio.
- ratio, deviation**—*See* deviation ratio.
- RC constant** — *See* time constant.
- RC coupling** — A resistor-capacitor network used to transfer a signal from one circuit or stage to another.
- RC oscillator**—*See* oscillator, RC.
- RCVR**—Abbreviation for receiver.
- RDF**—Abbreviation for radio direction finder.
- reactance**—The opposition offered an alternating electron flow by a capacitance or inductance. The amount of such opposition varies with the frequency of the current. The reactance of a capacitor decreases with an increase in frequency; the opposite occurs with an inductance.
- reactance modulation** — *See* modulation, reactance.
- reactivation of filament**—*See* filament reactivation.
- receiver, all-wave** — A radio receiver designed to receive signals on all of the commonly used bands, generally covering a range of frequencies from 500 kilocycles to 30 megacycles.
- receiver, communications**—A radio receiver primarily designed for reception of signals originating from stations in the radiocommunications services. This includes, among others, amateur and CB stations.
- receiver, diversity**—A receiver or receivers designed for use in a diversity system. (*Also see* diversity reception.)
- receiver, mobile**—A radio receiver that can be operated while in motion; i.e., a receiver that can be installed in a car, boat, airplane, etc.
- receiver, panoramic**—An oscilloscope and receiver combination that is designed to give a visual indication of any transmission occurring within a given range of frequencies. The receiver is periodically swept through

the frequency range and any signal received causes a vertical indication on the screen. The frequency range swept by the receiver is represented by the horizontal trace. With this device any transmission within a given frequency range can be located almost as soon as it occurs.

**receiver, radio**—An electronic device used to detect and demodulate the electromagnetic energy emitted by a radio transmitter. (*Also see specific type.*)

**receiver, radiotelegraph** — A radio receiver capable of selecting and reproducing modulated or unmodulated CW transmissions.

**receiver, regenerative**—A radio receiver that includes in its circuitry, a detector stage which employs a controlled amount of regeneration to increase the amplification it provides. (*Also see detector, regenerative.*)

**receiver sensitivity**—*See sensitivity, receiver.*

**receiver, short-wave**—A radio receiver capable of tuning in signals at frequencies above the commercial broadcast band (above 1.6 mc).

**receiver, single-sideband** — A superheterodyne receiver designed to receive transmissions which have no carrier and contain the

intelligence on a single sideband. The carrier is reinserted and the signal demodulated at the receiver. Sideband receivers are also generally capable of processing AM phone and CW signals.

**receiver, superheterodyne** —

A receiver that employs the heterodyne method of converting the frequency of incoming signals to a lower frequency. The difference or intermediate frequency (IF) is produced by combining the incoming signal with an RF signal from a local oscillator in a mixer stage. The resultant IF remains constant, regardless of the frequency of the incoming signal. In some multiband receivers it is not unusual to find the sum of signal and incoming frequency used as the IF.

**receiver, superregenerative**—

Generally a simple form of radio receiver using a superregenerative detector that provides a relatively high degree of amplification in addition to detecting incoming signals. (*Also see detector, superregenerative.*)

**receiver, TRF**—*See receiver tuned radio frequency.*

**receiver, tuned-radio frequency**—A radio receiver that uses several RF amplifier

stages tuned to resonance at the frequency of the desired incoming signal by a ganged variable-tuning capacitor. No frequency conversion occurs and the amplifiers tune broad enough to accept all frequencies within the tuning range of the receiver.

**receiver, tuned RF** — *See* receiver, tuned radio frequency.

**receiver, universal**—A radio receiver capable of operating from either alternating or direct current, without requiring any changes in circuitry.

**reception, diversity** — *See* diversity reception.

**reception, multipath** — Reception of a radio wave from more than one direction, in which case the two waves often have phase differences that cause fluctuation in signal level and often produce garbled or incoherent sounds.

**rectification, linear**—A rectifier whose output contains a wave that is identical to the information contained in a modulated wave. (*Also See* detection, linear.)

**rectifier**—A device that conducts current more readily in one direction than in the other and is used primarily to change AC current to DC current. Also the device and

associated components that comprise an AC to DC power supply.

**rectifier, bridge**—*See* bridge rectifier.

**rectifier, copper-oxide**—A rectifier that functions because a thin film of cuprous oxide on a copper plate offers a lower resistance to current moving in one direction than in the other.

**rectifier, crystal**—A rectifier that employs a semiconducting crystal, such as germanium or silicon, and a small contact called a “cat whisker.” Also called crystal diode or crystal detector.

**rectifier, full-wave**—A rectifier or rectifiers arranged in a circuit configuration that will provide conduction during both positive and negative swings of the alternating current.

**rectifier, half-wave**—A rectifier and associated components that provide for conduction of one half of the AC cycle.

**rectifier, solid-state**—Any of the group of rectifiers that employ the semiconducting properties of a solid as opposed to vacuum or gaseous-type rectifiers. Examples are silicon, germanium, copper oxide, etc.

**rectifier stack** — A group of individual rectifier units

- that have been incorporated into a single unit for the purpose of providing increased voltage or current capabilities.
- reference antenna**—*See* antenna, reference.
- reflected wave**—*See* wave, reflected.
- reflection, sporadic** — Radio waves that are reflected from the ionized E layer.
- reflector**—An antenna element or conducting surface used to reflect a portion of the radiated energy and thereby improve the directional characteristics of the antenna. *See* specific type.
- reflector, corner**—A reflector that is made of intersecting-plane surfaces and used to give directivity to a driven element.
- reflex circuit**—A circuit that is designed to amplify two widely separated frequencies. In a radio receiver the RF signal is amplified by an RF stage, the signal is demodulated, and the audio is returned to the input of the same stage for audio amplification.
- reflex klystron**—*See* tube, klystron.
- refracted wave**—*See* wave, refracted.
- refraction**—The bending of a radio wave or other wave energy when it passes obliquely from one transmission medium into another.
- refraction angle**—*See* angle of refraction.
- regenerative detector** — *See* detector, regenerative.
- regulated supply (power)**—*See* supply, regulated.
- regulator, line-voltage**—A device used to maintain a constant voltage on a line that supplies power to equipment.
- regulator tube**—*See* tube, voltage-regulator.
- reinsertor**—A circuit that re-establishes the DC reference level of a signal. (*Also see* clamper.)
- relaxation inverter**—A relaxation oscillator that is used to convert DC to AC.
- relaxation oscillator**—*See* oscillator, relaxation.
- relay**—A device that uses a relatively weak electrical change in one circuit to cause a stronger electrical change in another circuit. Also a receiving-transmitting station used to rebroadcast a signal. *See* specific type.
- relay, change-over**—A relay that is used to switch the antenna between the receiver and the transmitter. A manual switch can also be used to perform this function.
- relay drop-out current**—The value of the solenoid current through a relay at the

point where the armature drops away. The maximum current that fails to hold the relay closed.

**relay, locking**—A relay that remains closed after being pulled in. The relay is held closed by a mechanical latch or a permanent magnet.

**relay, overload**—A relay that is designed to open the supply line whenever the current exceeds a given value. A protective device that is designed to prevent damage to equipment from excessive current drains.

**relay, polarized**—A relay with an armature that can move to one of two positions, depending on the polarity of the current applied to the field. Polarization is usually accomplished through the use of permanent magnets.

**relay station**—*See* station, relay.

**relay, transfer**—A relay that is used to switch a circuit from one circuit to another. (*Also see* relay, change-over.)

**reluctance microphone** — *See* microphone, reluctance.

**remanence**—The amount of magnetic induction remaining in a ferromagnetic material after the magnetizing force is removed.

**remote control**—*See* control, remote.

**repeater**—In telegraphy, it is the station or the relay used to receive a weak signal and retransmit a stronger one.

**repeller**—An element in a vacuum tube that repels electrons. The element in a reflex klystron that returns the electrons back to the grids.

**resistance, ground** — *See* ground resistance.

**resistor spark plug**—*See* spark plug, resistor.

**resonance**—The characteristic of a circuit to oscillate at a particular frequency. The natural frequency at which the current will oscillate in a reactive circuit.

**resonant-frequency antenna**—*See* antenna, resonant-frequency.

**resonant-line oscillator**—*See* oscillator, resonant-line.

**resonator**—Any device that employs resonance effects. An electrical circuit that employs special arrangements of inductances and capacitances to produce resonance at a particular frequency or frequencies.

**resonator, butterfly**—A balanced system of rotary and stationary intermeshing plates arranged so that the system contains both inductance and capacitance. A change in the position of the butterfly rotor will

vary both capacitive and inductive reactance and thus and off, resulting in groups of frequency of the system.

**resonator, cavity**—A space completely enclosed by conducting walls and used as a tuned circuit at high frequencies. The cavity can be practically any shape, depending on the use and the tuning system to be employed. A shorted section of transmission line can be considered a resonant cavity.

**response, frequency**—*See* frequency response.

**resting frequency**—*See* frequency, resting.

**restorer, DC**—*See* clamper.

**RETMA** — Abbreviation for Radio Electronics Television Manufacturer's Association.

**RETMA color code**—*See* code, color.

**retentivity (magnetic)** — A characteristic of a magnetic material to retain a certain amount of magnetism after the magnetizing force is removed.

**RF**—Abbreviation. *See* radio frequency.

**RFC**—Abbreviation for radio-frequency choke. *See* choke, RF.

**rheostat**—A resistor that is designed so that a number of resistance values may be obtained without opening

the circuit. A variable resistor used to adjust the amount of current in a circuit.

**rhombic antenna**—*See* antenna, rhombic.

**ride gain**—To manually control the volume of a signal within certain limits to obtain maximum effectiveness from the radio transmission equipment.

**rig**—Slang term for amateur radio equipment. It can apply to a single piece of station equipment or, more commonly, to an entire setup.

**ring, corona** — *See* corona ring.

**ring oscillator** — *See* oscillator, ring.

**ripple frequency** — The frequency of the AC component of a DC voltage at the output of a rectifier or generator. For a full-wave rectifier the ripple frequency is twice the frequency of the AC source.

**ripple percentage**—Equal to the ratio of the rms value of the ripple voltage to the value of the DC voltage.

**ripple voltage** — The voltage fluctuations in the DC output of a rectifier or generator. An AC voltage superimposed on a DC voltage.

**RL constant** — *See* constant, RL.

**RMA**—Abbreviation for Ra-



- dio Manufacturers Association.
- rms** — Abbreviation. *See* root mean square.
- Rochelle salt crystal** — *See* crystal, Rochelle salt.
- rock**—Slang term for quartz crystal. Used to a great extent in amateur radio and other communications services.
- rockbound**—Common expression used in amateur radio to denote an operator who, by the terms of his FCC license or by the type of radio facilities he employs, is restricted to the use of crystal-controlled circuitry.
- rocking**—A term used to describe the method employed to track the RF and oscillator in a superheterodyne receiver. The dial is tuned (rocked) back and forth between low and high tuning points and adjustments are made at each end until optimum tracking is achieved.
- root mean square (rms)** — The effective value of an alternating current equal to a DC value that will produce the same power. For a sine wave, the rms value is .707 times the peak value.
- rotary beam antenna**—*See* antenna, rotary beam.
- rotary converter**—A rotating device used to change electrical energy from one form to another. (*Also see* dynamotor.)
- rotator, antenna**—The motor used to turn an antenna for best reception or transmission.
- rotor**—The rotating member of a machine: (1) armature of motor or generator, (2) moving plates of a rotary capacitor and (3) moving portion of a rotary switch. (*Also see* rotator, antenna.)
- RST system**—Abbreviation for readability, signal-strength, and tone. An abbreviated system of numbers used to indicate the strength and quality of radio signals. For example, a RST signal report of 5-9-9 indicates perfect readability, extremely strong signal, and the purest DC note.
- RT switch**—*See* TR switch.
- RTTY** — A radiocommunications system that employs teletype or teletypewriters. The devices used in this type of communications.

## S

**S/N**—Designation for signal-to-noise ratio. *See* signal-to-noise ratio.

**sand load** — An attenuator used to terminate a transmission line. The area between conductors is filled with a mixture of sand and carbon to absorb the RF energy. (*Also see* dummy load.)

**saturation**—In a magnetic circuit, a state of maximum magnetization where further increases in magnetomotive force produce little or no additional magnetic flux. Other types include plate saturation, temperature saturation, etc.

**saturation, limiter**—*See* limiter saturation.

**saturation, plate** — *See* plate saturation.

**Scalar**—A quantity that has magnitude but no direction.

**scattered reflections** — Ionospheric reflections which cause fading and interference to radio signals. These reflections vary not only in frequency range and intensity, but also in time of occurrence and geographical distribution.

**scatter propagation** — Propagation of high-power radio waves beyond the horizon by reflection from the ionosphere or troposphere.

**schematic diagram**—A graphical representation of an electrical circuit using specific symbols to denote the various components within the circuit.

**Schmidt trigger**—*See* multivibrator, regenerative-bistable.

**scrambled speech** — Speech which has been inverted in frequency for the purpose of making it unintelligible in sending messages. The speech is reconstructed to its normal form at the receiving point.

**screen grid**—*See* grid, screen.

**screen-grid modulation** — *See* modulation, screen-grid.

**secondary cell**—*See* cell, secondary.

**secondary emission** — *See* emission, secondary.

**secondary winding**—*See* winding, secondary.

**selective calling**—A system whereby any single station or all stations within a network can be alerted for a message. Usually one or more coded tones or pulses of the proper sequence or frequency are transmitted along with the carrier to alert the desired station or stations being called. A decoder at the receiving station then actuates a bell, buzzer, light, or similar in-

- indicator.
- selective fading**—*See* fading, selective.
- selective interference**—*See* interference, selective.
- selectivity**—The ability of a circuit or device to select a desired signal and reject those on adjacent frequencies. The degree of attenuation in the response of a resonant circuit or device in departure from the resonant frequency. (*Also see* specific type.)
- selectivity, adjacent-channel**—The ability of a radio receiver to reject signals originating on channels adjacent to the desired channel.
- selenium rectifier**—An iron or aluminum plate which is coated with a thin layer of selenium. The selenium on the aluminum is coated with a special alloy and current flows easily from the coating to the selenium. In the iron selenium type the current flows easily from iron to selenium. The plate serves in both instances as a heat sink and radiator.
- self bias**—*See* bias, cathode.
- self-modulated oscillator**—*See* blocking, oscillator.
- self excitation**—The supplying of field current to a generator from its own output.
- Selsyn** — General Electric trade name for a synchro.
- semiautomatic key**—*See* key, semiautomatic.
- semiconductor** — A material possessing electrical conduction properties that fall somewhere between conductors and insulators. A few familiar semiconductors are, silicon, germanium, selenium, and copper oxide.
- sense antenna** — *See* antenna, sense.
- sensitivity**—A measure of the smallest amount of input signal to a device that is needed to obtain a specific output signal or function.
- sensitivity, quieting** — The smallest amount of unmodulated signal applied to the input of a receiver that will reduce the noise output to 30 db below the output obtained with a standard modulated signal.
- sensitivity, receiver**—The input signal with standard modulation (30% at 400 cycles for AM) that is required to obtain a standard test value at the receiver output.
- sensitivity, squelch** — The smallest amount of input signal that will produce an output with a given setting of the squelch circuit.
- servomechanism** — A device actuated by electric, hydraulic or mechanical energy that performs some me-

chanical function. A servo system used to perform a mechanical function.

**servo system**—A system used to transfer accurate mechanical positions from one place to another by electrical means.

**set**—(1) An assembly of components that operate as a whole unit, e.g., handset test set. (2) To place in position or adjust for a particular position (setting).

**SG**—Symbol for screen grid.

**shading ring**—The heavy copper ring placed around a portion of the pole piece on small motors to produce a rotating field.

**SHF**—Abbreviation for super-high frequency. *See* band, SHF.

**shield**—(1) A sheet or screen of metal, usually aluminum or copper, placed around an electronic circuit or between circuits to short to ground any unwanted radiation. (2) A sheet of highly permeable metal (iron) placed around or between circuits to provide an easy path for the magnetic lines of force.

**shielded cable**—One or more wires enclosed by a protective metal braid or tape to prevent the wires from picking up unwanted signals.

**shielded wire**—Wire that is

enclosed in a metallic sheath to prevent it from picking up stray radiation.

**shock excitation**—The introduction of damped oscillations as the result of a sudden voltage surge or pulse.

**short-wave receiver**—*See* receiver, short-wave.

**short-wave transmitter** — *See* transmitter, short-wave.

**shot noise**—*See* noise, shot.

**shunt** — (1) Any component connected in parallel with another component. (2) A precision value resistance placed across the terminals of a meter to change its current range.

**shunt-excited vertical antenna** —*See* antenna, shunt-excited vertical.

**sideband**—One of the two sets of frequencies produced on each side of the carrier by the modulating signal. The sidebands contain the sum of (upper sideband) and difference between (lower sideband) the carrier and the modulating frequencies.

**sideband attenuation**—The reduction in amplitude of some part of the transmitted sidebands below that produced in the modulation system.

**sideband, double**—*See* modulation, double-sideband.

**sideband, lower**—The group of frequencies representing the difference between the

carrier frequency and the modulating frequencies. The modulation components of a wave that occupy a portion of the frequency spectrum below the carrier.

**sideband, single** — *See* modulation, single-sideband.

**sideband, upper**—The group of frequencies representing the sum of the carrier frequency and the modulating frequencies. The modulation components of a wave that occupy a portion of the frequency spectrum above the carrier frequency.

**signal booster**—*See* preamplifier.

**signal compression**—*See* compression, signal.

**signal, driving** — The signal applied to the output or power stage of a transmitter. The signal output of a driver. (*Also see* excitation.)

**signal generator** — An instrument containing oscillators and associated circuits to develop special waveforms having waveshapes, amplitudes, and frequencies that can be used for test purposes.

**signal generator, all-wave**—A signal generator with signal output frequencies that cover most of the standard communications frequencies. Most all-wave generators produce frequencies

from about 100 kc to around 200 mc. The high-end coverage often uses harmonics of a lower frequency.

**signal-strength meter** — *See* meter, S.

**signal-to-noise ratio (S/N)**—A ratio of the signal level to the noise level in an amplifier or receiver. Often expressed in decibels.

**silent period**—A specified period each hour in which the operator of all ship stations employing radiotelegraphy must monitor one of the emergency bands (500 kc, 143 kc, or 2182 kc) for any distress calls.

**silicon diode**—*See* diode, silicon.

**silicon (Si)**—Atomic number 14; a semiconducting element used extensively in diodes, rectifiers, transistors, and other solid-state electronic devices.

**silicon transistor**—*See* transistor, silicon.

**simpler operation**—Operating method in which transmission is made alternately in each direction, for example, by means of manual control or push-to-talk operation.

**single-conversion superheterodyne** — *See* superheterodyne.

**single-ended stage**—An electronic stage that employs

only one tube as opposed to a push-pull circuit that uses two or more.

**single-sideband receiver**—*See* receiver, single-sideband.

**single-tone keying**—*See* keying, single-tone.

**skip** — A condition whereby radio waves propagated skyward are bent back to earth at some remote point by ionized layers of gases in the ionosphere. This condition can occur once or several times.

**skip distance**—That distance between the point where a radio wave leaves the earth and the point where it is received after reflection from the normal ionized layers of the ionosphere.

**sky wave**—*See* wave, sky.

**slot antenna** — *See* antenna, slot.

**slug tuning**—*See* permeability tuning.

**S meter**—*See* meter, S.

**smoothing choke**—*See* choke, smoothing.

**soft tube**—(1) A high-vacuum tube that is defective because of the presence of gas in the tube. (2) A gaseous tube, e.g., voltage regulators, gaseous rectifiers, etc.

**solenoid** — A coil of wire through which an electric current is passed to produce an electromagnet. An iron core is usually placed in-

side the coil to concentrate the magnetic field at the ends of the coil. Used to actuate a mechanical device with an electrical signal.

**SOS**—International distress signal used in telegraphy; the counterpart of Mayday in telephony.

**sound level meter**—*See* meter, VU.

**sound-powered phone**—A telephone system that employs transmit and receive elements that require no batteries or external power source. The power to actuate the receiver at the far point is obtained by the highly efficient conversion of acoustic energy (human voice) into electric energy. Also the handset used in such a system.

**sound proofing**—The addition of sound absorbent material to room surfaces. Improves the overall sound characteristics of the room by reduction of the amount of sound conducted through the wall and reflected from the surfaces of the room.

**space diversity**—*See* diversity, space.

**space wave**—*See* wave, space.

**spark frequency**—The rate of sparking (number of sparks per second) in a spark transmitter.

**spark-gap transmitter** — *See* transmitter, spark-gap.



**spark plug, resistor**—A type of automotive spark plug that incorporates a built-in resistance (usually around 10,000 ohms) to suppress the pulse-type ignition noise that is troublesome in radio reception.

**spark-plug suppressor** —  
*See* suppressor, spark-plug.

**SPDT(switch)**—Abbreviation for single-pole double-throw. Contains a single contactor that can be switched between two contacts.

**speaker, capacitor**—A speaker in which movement of the diaphragm is brought about by electrostatic interaction between two relatively large, closely spaced, metal plates. The electrostatic field that exists between the plates varies in proportion to the audio signal applied to the plates. Also called *condenser speaker*.

**speaker, condenser**—*See* speaker, capacitor.

**speaker, crystal**—A speaker in which mechanical displacement of the diaphragm is produced by piezoelectric action. Also called a piezoelectric speaker.

**speaker, dynamic**—A speaker consisting primarily of a cone, or diaphragm, with a voice coil attached, and a source of magnetic ener-

gy. Audio signals applied to the voice coil cause corresponding movements of the coil within the fixed magnetic field of the speaker.

**speaker, electromagnetic**—A dynamic speaker that uses an electromagnet as the source of magnetic field energy. (*Also see* speaker, dynamic.)

**speaker, electrostatic** — *See* speaker, capacitor.

**speaker, permanent-magnet**—  
A dynamic speaker that uses a permanent magnet to provide the fixed magnetic field necessary for operation. (*Also see* speaker, dynamic.)

**spectrum**—Frequencies or radiations that exist in a continuous range and have a common characteristic. A spectrum may be inclusive of many spectrums; e.g., the electromagnetic radiation spectrum includes the light spectrum, radio spectrum, infrared spectrum, etc.

**spectrum analyzer**—*See* analyzer, spectrum.

**spectrum, radio** — *See* radio spectrum.

**speech amplifier**—*See* amplifier, speech.

**speech clipper**—A circuit employed to reduce or cut off high audio peaks to prevent overmodulation of a

carrier wave.

**speech compression**—*See* compression, audio.

**speech level**—A measure of the energy contained in speech or music as indicated by a VU meter.

**splatter**—A term used quite often (especially in amateur radio) to denote the spurious sidebands produced as the result of overmodulating an AM signal. These sidebands contain the same information as those adjacent to the carrier, but they occur at multiples which may extend considerably outside the legal band limits and cause considerable interference to stations operating within the same band.

**split rotor plates**—The plates on a tuning capacitor that contain cuts to facilitate bending during the alignment and tracking of a receiver.

**sporadic E layer**—*See* E layer, sporadic.

**sporadic reflection** — *See* reflection, sporadic.

**SPST (switch)**—Abbreviation for single-pull single-throw. Contains a single contactor that can be switched to open or close a circuit.

**spurious emission**—Emission on a frequency or frequencies outside the necessary band, and the level of which

may be reduced without affecting the corresponding transmission of information. Includes harmonic and parasitic emissions and intermodulation products.

**spurious radiation**—*See* radiation, spurious.

**sputter**—The metal that is deposited on the inner face of a gas discharge tube. The material is evaporated from the electrodes and deposited on other parts of the device. This action is undesirable and reduces the life of the tube.

**square-law demodulator**—*See* demodulator, square-law.

**square-loop antenna**—*See* antenna, square-loop.

**squegging**—The action of an oscillator that oscillates for a number of cycles and then cuts off due to grid blocking. Self blocking or self pulsing.

**squelch**—An automatic function in a receiver that blocks the audio amplification in a receiver during the absence of a signal or when the receiver is being tuned between stations.

**squelch, carrier-operated**—A squelch circuit that actuates a receiver on the reception of a carrier wave. Modulation on the carrier has no effect on this squelch circuit.

**squelch, noise-operated** — A squelch circuit in FM re-

ceivers that rectifies the output of the limiter stage, filters out the RF, and uses the noise to cut off the audio amplifier. An FM signal that has enough amplitude to be limited will contain no amplitude modulation and therefore no noise; the receiver audio opens up to permit amplification of the signal.

**squelch sensitivity**—*See* sensitivity, squelch.

**squelch, tone**—A squelch system that requires a specific tone or combination of tones to unblock the audio. Generally, the transmitted signal is accompanied by a tone of the proper frequency, pulse duration, or pulse sequence, to activate a decoder at the receiver. Used in two-way radio systems where it is only desirable to receive messages from other stations within the network. Transmissions from stations outside this network will not activate the decoders, and hence will not be received. (*Also see* selective calling.)

**SSB**—Abbreviation for single sideband. *See* modulation, single-sideband.

**stage**—(1) A step in an operation. (2) An electron tube or transistor and the associated circuit. (3) Two or more tubes or transis-

tors connected in push-pull, parallel cascade, etc., and perform the same function as one tube.

**stagger tuning**—A method of tuning a series of IF stages to achieve a broad-band response. The alternate stages are tuned to slightly different frequencies, and the entire system is adjusted to achieve a definite response.

**standard antenna**—*See* antenna, reference.

**standard broadcast band**—The band of frequencies extending from 535 kc to 1605 kc.

**standard cell**—*See* cell, standard.

**standard frequency**—*See* frequency, standard.

**standing wave**—*See* wave, standing.

**standing-wave ratio (SWR)**—A ratio of the maximum amplitude to the minimum amplitude of a standing wave stated in current or voltage amplitudes. Ratio of a current or voltage loop to a current or voltage node.

**static**—(1) Fixed, not moving. (2) the interference heard in a radio receiver as a result of electrical (man-made) or atmospheric (natural) disturbances.

**static charge**—An electrical charge that is bound to an object. An unmoving elec-

trical charge.

**static eliminator, wheel**—A metal contact that is installed in the grease cover of a wheel to conduct the static charges generated by the wheel to ground. The device maintains electrical contact between the rotating wheel and the spindle (axle).

**static interference**—*See* interference, static.

**static noise**—*See* noise, static.

**static suppressor**—*See* suppressor, static.

**static, wheel**—A form of interference to radio reception caused by a buildup and discharge of static electricity between the wheel of a moving vehicle and the axle on which it is mounted.

**static suppressor, wheel**—*See* static eliminator, wheel.

**station** — An assembly of equipment capable of generating and radiating radio waves into space. This includes the radio transmitter, the antenna, and any associated devices.

**stationary wave**—*See* wave, standing.

**station, base**—A station not intended for operation while in motion. Generally a principal, or key, station in a specific radio system.

**station, key** — *See* station, base.

**station, land-based**—A station

that is operated from a permanent location on land, as opposed to station permanently installed on a ship. (*Also see* station, base.)

**station license**—A license issued by the Federal Communications Commission authorizing the installation and operation of a specific radio station as prescribed by the rules and regulations governing the type of service for which it is to be used.

**station log**—A documentary record of station operation. Required by the FCC to be kept in certain radio services. Usually contains such information as date and time of transmission, identification of station in communication with, frequency of operation, transmitter power, type of emission, etc. May also include records of equipment repairs.

**station, mobile**—A station designed to be operated while in motion or during halts at unspecified points. General term referring to radio equipment installed in cars, boats, etc.

**station, portable**—A general term for two-way radio equipment constructed in such a way as to permit easy movement from one

location to another, but not necessarily designed to permit operation while it is being moved.

**station, relay**—A station that receives and rebroadcasts radio signals to one or more stations beyond the normal range of the one from which the signals originated. This operation may be entirely automatic and simultaneous as in the case of a repeater station, or an operator at the station may record the message and subsequently pass it along to other stations.

**steatite**—A magnesium silicate rock that is shaped and then fired to form a ceramic. It is used for high-frequency insulators and stands up well under high strain and shock conditions.

**Sterba curtain antenna**—*See* antenna, sterba curtain.

**storage battery**—*See* battery, storage.

**stray capacitance**—The capacitance that exists between components, wiring, chassis, ground, etc. The effects from these capacities can be particularly annoying at higher frequencies.

**stub antenna**—*See* antenna, stub.

**stub, matching**—*See* impedance-matching stub.

**stub tuners**—A section of transmission line having an

adjustable short. Used to match impedances in a line to which it is attached.

**subcarrier**—A carrier that is used to modulate a main carrier. The subcarrier is modulated with the information wave.

**subharmonic**—A frequency that is a submultiple of a fundamental frequency. A frequency that is one fifth of the fundamental frequency is the fifth subharmonic.

**subsonic**—*See* frequency, subsonic.

**sunspot**—Areas of increased solar activity that are known to be the cause of magnetic and electrical disturbances to the radio-communications services.

**superfluous radiocommunication**—Any transmission that is not necessary in properly carrying on the service for which the station is licensed.

**superhet**—A typical expression for a superheterodyne receiver.

**superheterodyne**—A method of receiving an RF signal by mixing or heterodyning it with a local oscillator signal to produce an IF signal. The IF signal is then amplified and detected, and the audio is sent to an audio amplifier. (*Also see* receiver superheterodyne.)

**superheterodyne, double-con-**



**version**—*See* superheterodyne, dual-conversion.

**superheterodyne, dual-conversion** — A superheterodyne system that is used to convert a high frequency to a low IF frequency in two conversion steps. First the incoming signal is converted to a high intermediate frequency, amplified and then reconverted to the desired IF.

**superregenerative receiver**—*See* receiver, superregenerative.

**supersonic**—Denotes speeds in excess of the speed of sound. For frequencies above the audio range, *see* ultrasonic.

**supply, A**—The battery or device used to supply current and voltage to the filaments of vacuum-tube equipment.

**supply, AB**—*See* power pack, AB.

**supply, B**—A battery or other device used to supply voltage and current for the plate circuits of vacuum-tube equipment.

**supply, C**—The battery or device used to supply voltage to bias the grids in vacuum-tube equipment.

**supply, power**—A battery or device composed of transformers, rectifiers, filters, etc. used to supply electric power to electronic equipment. *See* specific supply.

**supply, regulated**—A power

supply that is designed to provide a voltage or current whose value is controlled within given limits.

**supply, vibrator**—A power supply that uses a vibrator to chop the low voltage from a battery into pulses that can be transformed into the higher voltages needed for vacuum-tube operation.

**suppressed-carrier transmission** — *See* transmission, suppressed-carrier.

**suppressor**—A device used to reduce or eliminate unwanted actions in electric or electronic circuits. A device that suppresses. *See* specific type.

**suppressor, distributor-noise** —A resistor that is installed in series with the high-tension leads of an engine ignition system. The resistance lowers the Q of the leads and reduces RF oscillations.

**suppressor, generator-noise**—A capacitor that is connected between the output terminals of an automotive generator and ground to reduce the noise generated by brush arcing.

**suppressor grid**—*See* grid, suppressor.

**suppressor, harmonic** — *See* harmonic suppressor.

**suppressor, parasitic**—A re-



sistor, inductor, or capacitor used to suppress parasitic oscillation in an oscillating or pulsing system.

**suppressor, spark-plug** — A spark plug that is manufactured with a series resistance built into the plug. The resistance lowers the Q of the circuit and reduces radiation at RF frequencies.

**suppressor, static**—A device used on moving or rotating equipment to prevent the build up of static charges that will interfere with radiocommunications.

**suppressor, wheel-static**—*See* static eliminator, wheel.

**SW** — Abbreviation for (1) short wave (2) switch.

**swinging choke**—*See* choke, swinging.

**switch, antenna**—*See* antenna switch.

**SWL**—Abbreviation for short-

wave listener.

**SWR** — Abbreviation. *See* standing-wave ratio.

**synchro**—A system involving two or more rotating devices; one (transmitter) is supplied with AC power and an amplified version of the others (receivers). The receivers follow the motion of the transmitter.

**synchronous demodulator** — *See* demodulator, synchronous.

**synchronous vibrator**—A vibrator that has two sets of points; one set to switch the primary voltage to the transformer and the other to switch the secondary voltage in synchronism with the current reversals in the transformer. The output from this arrangement is an increased DC voltage that needs no rectification.

## T

**T**—(1) Abbreviation for temperature. (2) Symbol used to designate a thermistor on a schematic.

**t**—Abbreviation for time.

**tandem**—*See* cascade.

**tank circuit**—*See* circuit, tank.

**tape keyer**—*See* keyer, tape.

**taper**—(1) As related to a potentiometer, the relation between the change in resistance and the mechanical position of the shaft. (2) The change in electrical characteristics of a device related to the length, rotation, or other physical dimension.

**taper, left hand**—A potentiometer or rheostat in which the maximum-resistance change occurs at the counter-clockwise end of the rotation.

**taper, right-hand**—A potentiometer or rheostat in which the maximum-resistance change takes place at the clockwise end of the rotation.

**tape transmitter**—*See* transmitter, tape.

**TE**—Abbreviation for transverse electric.

**telecast**—Short for television broadcast.

**telecommunication** — Any transmission, emission, or reception of signs, signals, writing, images, and

sounds, or intelligence of any nature by wire, radio, optical, or other electromagnetic systems.

**telegraphy**—A system of telecommunication for the transmission of written matter by the use of a signal code.

**telephony**—A system of telecommunications set up for the transmission of speech or, in some cases, other sounds.

**teletype**—A system for sending and receiving typewritten messages over a distance by using a teletypewriter at the sending and receiving positions.

**television band**—*See* band, television.

**television interference (TVI)**—*See* interference, television.

**terminal**—A point in a circuit on a device that provides electrical access for making measurements or for connecting other components or leads.

**terminal, common** — A terminal that is shared electrically by a number of conductors and components. Usually a ground terminal that provides a zero-potential reference point for a number of components, circuits, and electrical de-

- vices.
- terminal impedance**—*See* impedance, terminal.
- tetrode**—*See* tube, tetrode.
- TE wave**—*See* wave, TE.
- T filter**—*See* filter, T.
- thermal conduction**—The passage of heat energy through a material.
- thermal detector**—A device used in the measurement of microwave energy. Contains a resistive element that increases in resistance as it is heated by RF energy. Also called a bolometer. (*Also see* barretter, thermocouple, and thermistor.)
- thermal noise**—*See* noise, thermal.
- thermion**—An ion (either positive or negative) that is emitted from a material due to heat.
- thermionic cathode**—*See* cathode, thermionic.
- thermionic emission** — *See* emission, thermionic.
- thermistor**—A small head of metallic oxides to which small contact wires have been attached. The thermistor exhibits a negative temperature coefficient.
- thermocouple**—A junction of two dissimilar conductors whereby a voltage is developed between the two due to thermoelectric effects when the two junctions at opposite ends are at different temperatures.
- threshold level**—The level at which a specific effect is first produced or indicated. Also the verge of initiating a circuit action.
- thyatron**—*See* tube, thyatron.
- time constant**—The length of time it requires a voltage or a current to reach 63% of its final value or to drop to 37% of the initial value.
- TM**—Abbreviation for transverse magnetic.
- TM wave(s)**—*See* wave(s), TM.
- tolerance**—The permissible deviation from an assigned or rated value.
- tolerance, frequency**—*See* frequency tolerance.
- tone-coded squelch** — *See* squelch, tone.
- tone-modulated wave** — *See* wave, tone-modulated.
- top-loaded antenna**—*See* antenna, top-loaded.
- toroid** — A doughnut-shaped coil. A helically wound coil on a circular core.
- tower**—A wooden or metal structure used to support an antenna.
- T pad**—A pad in which the resistive elements are connected in a configuration that resembles the letter T. *See* pad.
- TR**—Abbreviation for transmit-receive.
- tracking**—A term denoting the relationship between the

resonant frequency of receiver-tuned circuits and the frequency indicated by the tuning-dial pointer. Also called dial tracking.

**traffic**—A term used for messages handled by radiocommunications, i.e., the dispatcher of a police department in a large city handles a considerable amount of traffic on Saturday nights.

**transceiver**—A combination transmitter and receiver built on a common chassis and having one or more stages (excluding the power supply) common to both modes of operation.

**transconductance**—The ratio of a small change in plate current to the small change in grid voltage that produced the plate current change.

**transconductance, conversion**—The ratio of the IF current in the output of a converter stage to the voltage of the RF signal that produces the current.

**transducer**—A device that is capable of receiving power from one or more sources and of delivering this power in the same or changed form to one or more systems. A speaker is an electro-acoustic transducer that accepts electric power and converts it to acoustic power. The transformer accepts

electric power and distributes electrical power.

**transfer relay** — *See* relay, transfer.

**transformer**—An electrical device usually comprised of two or more coils of wire wound on a common form or around a metallic core. Used to match the impedances of two circuits or by magnetic induction transfer energy from one circuit to another at the same frequency but generally at a higher or lower voltage and/or current. *See* specific type.

**transformer, matching**—*See* impedance-matching transformer.

**transient**—An instantaneous but momentary surge of current or voltage caused by an abrupt change from one circuit condition to another. A temporary condition that depends, for its existence, on a previous action.

**transistor**—A term used to describe a variety of solid-state devices that can be used to control the flow of electric current.

**transistor base**—The control electrode in a transistor. The element of a transistor that must be one of the terminals in the input circuit.

**transistor collector**—The terminal of a transistor into

which electric charges flow. The element of a transistor that must be one terminal in the output circuit.

**transistor emitter**—The element in a transistor that emits or injects charges into the base region. The emitter may be one of the terminals in either the input or output circuit.

**transistor, germanium** — A transistor that employs germanium as the semiconducting material.

**transistor, silicon**—A transistor that employs silicon as the semiconducting material.

**transistor type, complementary**—The two types of transistors that have contrasting characteristics. The polarity of the semiconductor material used in the fabrication of the two types is reversed. The polarities of the two types contrast or complement each other.

**transit time**—The time required for an electron or movable charge to travel between two electrodes.

**transmission**—Transfer of electrical or electromagnetic energy from one point to another either through conductors or by radiation through free space.

**transmission, frequency-shift** —A method of transmitting code whereby the frequency

of the carrier is shifted back and forth between two specific frequencies as a means of designating mark and space. This takes the place of keying the transmitter on and off.

**transmission level**—A ratio of the signal power at one point in a transmitting system to the signal power at another point used as a reference.

**transmission line** — An arrangement of two or more conductors used to transfer energy from one location to another.

**transmission line, coaxial**—A cylindrical transmission line comprised of a center conductor and outer shielding conductor separated by a dielectric material. This combination is covered with an insulating jacket. Also called concentric line.

**transmission line, open-wire**—A transmission line composed of two uninsulated conductors that are separated by insulated spacers.

**transmission line, pressurized** —An air-tight transmission line that is filled with dry air or an inert gas to preclude problems of moisture etc. It is usually composed of a smaller tubular conductor placed within a larger one but separated from it by insulated spacers.

**transmission line, ribbon**—A line composed of two or more conductors separated by a ribbon of dielectric material.

**transmission, suppressed-carrier**—A method of transmitting intelligence without the use of a carrier. The carrier is generally suppressed at the transmitter but restored at the receiver to permit demodulation.

**transmission, vertical-incident**—A form of transmission in which radio waves are transmitted vertically to the ionosphere and back to earth.

**transmitted wave**—*See* wave, transmitted.

**transmitter**—Broad term for any device capable of generating and radiating RF energy. It may or may not convey a form of intelligence. (*Also see* specific type.)

**transmitter, aural**—The electronic device employed to transmit the sound, or audio, signals from a television broadcast station.

**transmitter, auxiliary**—An extra, or standby, transmitter held aside for use in case the existing equipment fails.

**transmitter, crystal-controlled**—A radio transmitter that uses a quartz crystal or sim-

ilar piezoelectric material as the frequency-determining element in the oscillator. Crystals are used in cases where a high degree of frequency stability is desired.

**transmitter, fixed-frequency**—A radio transmitter that is designed for operation on a single frequency or channel. It can usually be operated on other frequencies with some circuit revision and retuning, but the operation cannot readily be changed as in the case of a band-switching transmitter or one using a variable-frequency oscillator. It may or may not be crystal-controlled.

**transmitter, multiband**—A transmitter designed for operation on one or more bands of frequencies. It may employ a mechanical band switching arrangement, or it may require a somewhat more involved method of changing circuit components.

**transmitter, short-wave**—A radio transmitter capable of producing and radiating radio signals at frequencies above the commercial broadcast band (above 1.6 mc).

**transmitter, spark-gap**—An early type of transmitter that employs the oscillatory discharge of a capacitor



through a coil and spark gap as the source of RF energy. This transmitter is now obsolete and its use on the airways is prohibited.

**transmitter, tape**—A device used for high-speed keying of code signals when activated by a prepunched paper tape.

**transverse electric wave(s)**—*See* wave(s), TE.

**transverse magnetic waves**—*See* wave(s), TM.

**transverter**—An electronic device similar to a transceiver except that the receiver section is incomplete. It generally consists of a complete transmitter and an RF converter, or tuning unit, which must be used in conjunction with a separate audio amplifier or the audio section of an existing receiver, e.g., the broadcast receiver in an automobile.

**trap**—A filter or network used to absorb or remove an undesirable signal from a signal path.

**trapped dipole antenna**—*See* antenna, trapped dipole.

**traveling-wave tube (TWT)**—*See* tube, traveling-wave.

**TRF**—Abbreviation for tuned-radio frequency. *See* receiver, tuned-radio frequency.

**triode**—*See* tube, triode.

**tritnet oscillator**—*See* oscillator, tritnet.

**troposphere**—The portion of

the earth's atmosphere that extends from the surface of the earth to a height of about 60 miles.

**tropospheric wave**—*See* wave, tropospheric.

**TR switch**—Transmit-receive switch. A device used to keep the transmitted RF energy from damaging the receiver input circuits. One method is to ground the input to the receiver during transmission. (*Also see* tube TR.)

**TR tube**—*See* tube, TR (*Also see* TR switch.)

**tube, acorn**—An acorn-shaped tube with pins that extend radially from the body of the tube and on some tubes a pin extends from one or both ends.

**tube, ballast**—A resistance element enclosed in a vacuum-tube-type envelope that is used as a current-control device. Installed in series with a load, the ballast increases in resistance as current increases and thereby tends to maintain a constant current despite changes in loading or input voltage.

**tube, carcinotron**—A microwave tube that operates on principles similar to the traveling-wave tube except that the relation between the beam and the wave is different.

**tube, cathode-ray (CRT)**—A

vacuum tube that produces an electron beam that is focused on a fluorescent screen and can be deflected by externally applied signals to provide a visual display of electrical waveforms.

**tube, discharge**—A tube containing a low-pressure gas that permits the passage of current when the applied voltage becomes sufficiently high.

**tube, doorknob**—A vacuum tube shaped like a doorknob and designed for UHF transmitter use. The shape permits close spacing or small electrodes and improves the high-frequency characteristics.

**tube, electron**—An evacuated container enclosing a number of electrodes that are arranged to provide control of an electric current. Also gas-filled tubes that employ certain characteristics of the gas to obtain current control.

**tube, electron-multiplier** — A tube that uses the secondary emission from a series of anodes to provide amplification of a signal. The amplification is equal to the ratio of the number of electrons that reach the last anode to the number of electrons striking the first anode.

**tube, electron-ray tuning-indicator**—An indicator containing a coated plate (screen) that is made to fluoresce by controlling the way in which the electrons strike the screen.

**tube, flash**—A gas-filled tube that is designed to give off a flash of light when an electric current is passed through the gas.

**tube, gas**—An electron tube that contains a gas that is ionized and becomes the conducting medium.

**tube, gated-beam**—An electron tube, usually a pentode, with a sharp cut-off characteristic. A sheet of electrons is formed between the cathode and plate; this sheet beam can be deflected away from the plate, thus effectively gating the anode current.

**tube heater**—*See* heater, tube.

**tube, heptode**—A seven-electrode tube containing a cathode, anode and five grids. (*Also see* pentagrid converter.)

**tube, hexode**—A six-element electron tube usually employed as a converter. Contains a cathode, anode, and four grids.

**tube, hot-cathode** — A tube that employs a heated surface as the electron emitter. The cathode may be the indirectly heated type or the

filamentary cathode.

**tube, ignitron**—A mercury-vapor rectifier of the cold-cathode type. This tube contains a third electrode that is used as an ignitor to start current conduction.

**tube, kenotron**—A high-vacuum rectifier used for high-voltage, low-current applications. Used in equipment such as X-ray and precipitrons.

**tube, klystron**—An electron tube in which the electron beam is modulated. The RF energy is derived from the effect of the bunched electrons on a tuned cavity.

**tube, lighthouse**—A tube that is constructed so that a series of discs become the external contacts, and these match a coaxial cavity arrangement to provide an oscillator with almost no radiation leakage.

**tube, magnetron**—A tube in which oscillation is produced by the transit time of electrons moving in a magnetic field.

**tube, mercury-vapor**—A high-current rectifier in which a mercury vapor is produced to act as the conducting medium.

**tube, octode**—An eight-electrode vacuum tube containing an anode, cathode, and seven grids. Generally used as a converter.

**tube, pentagrid converter**—A tube containing five grids of which two are used as input grids, one for signal, and one for oscillator injection.

**tube, pentode**—A tube containing five electrodes, consisting of anode, cathode, signal grid, screen grid, and suppressor grid.

**tube, tetrode**—A tube containing four electrodes, consisting of anode, cathode, signal grid, and one other grid.

**tube, thyatron**—A gas-discharge tube containing a heated cathode, an anode, and one or more control electrodes or grids. Used as a controlled rectifier or electronic switch.

**tube, TR** — Transmit-receive tube. A tube, usually gas-filled and installed in an antenna system, that is common to both transmitter and receiver to block passage of RF to the receiver during a transmission. Sometimes used to block the transmitter output circuit during the reception of a signal.

**tube, traveling-wave**—A microwave amplifier tube in which a guided wave is made to interact with a beam of electrons in a manner which causes beam energy to be converted into

RF energy. The energy conversion takes place in direct proportion to the amplitude of, and in-phase with, the original wave. Amplification of AM, FM, or PM waves is possible with this tube.

**tube, triode**—An electron tube containing three basic elements, cathode, control grid, and anode.

**tube, voltage-regulator** — A cold-cathode tube containing an inert gas that is ionized when sufficient voltage is applied to its electrodes. The amount of current passing between the electrodes is determined by the degree of ionization and this, in turn, depends on the applied voltage. The ionization potential varies with different gases and different pressures.

**tuned, broad**—A condition whereby the response of a tuned circuit falls off gradually at frequencies just above and below the resonant frequency.

**tuned-grid oscillator**—*See* oscillator, tuned-grid.

**tuned-grid tuned-plate oscillator**—*See* oscillator, tuned-grid tuned-plate.

**tuned-plate oscillator**—*See* oscillator, tuned plate.

**tuned radio-frequency (TRF)** —*See* receiver, tuned radio-frequency.

**tuned-reed frequency meter**—*See* Frahm frequency meter.

**tuned, sharp**—A condition whereby the response of a tuned circuit drops off sharply at frequencies just above and below the resonant frequency.

**tuning eye**—*See* tube, electron-ray tuning indicator.

**tuning indicator**—Any device that provides a visual indication of tuning, e.g., a meter, neon lamp, cathode-ray tuning indicator, etc.

**tuning, permeability** — *See* permeability tuning.

**tuning wand**—An insulated rod having a brass plug in one end and a powdered-iron core at the opposite end. Used primarily in the alignment of radio receivers. When the brass end is placed in or near a tank coil, the resonant frequency of the tuned circuit is increased; the powdered-iron core decreases the frequency.

**twin lead**—*See* transmission line, ribbon.

**turnstile antenna**—*See* antenna, turnstile.

**TV**—Abbreviation for television.

**TVI**—Abbreviation for television interference. *See* interference, television.

**twisted pair**—Slang term used

in amateur radio meaning  
telephone lines.  
**two-tone keying**—*See* keying,  
two-tone.

**TWT** — Abbreciation for  
traveling-wave tube. *See*  
tube, traveling-wave.

## U

**UHF**—Abbreviation for ultrahigh frequency. *See* band, UHF.

**ultrasonic**—Having a frequency above that of sound (above 20,000 cycles per second).

**ultraviolet**—A region of the electromagnetic radiation spectrum at about 4,000 angstroms. Ultraviolet radiation is that just above the visible light frequencies.

**umbrella antenna**—*See* antenna, umbrella.

**undermodulation**—Insufficient modulation of a radio transmitter, or a percentage of modulation less than that of a given reference (usually 100%).

**unidirectional antenna** — *See* antenna, unidirectional.

**undistorted output, maximum**—The maximum power

a circuit or device will deliver without exceeding an arbitrarily low level of distortion specified for a specific test or operation.

**universal receiver**—*See* receiver, universal.

**universal supply**—A power supply capable of operation from either AC or DC without major circuit changes.

**upset duplex system**—A direct current telegraph system in which the duplex balance can be upset by a station located between any two pieces of duplex equipment. The upset occurs when this station begins transmitting signals by opening and closing the line circuit.

**upward modulation**—*See* modulation, upward.



## V

- v**—Abbreviation for volt.
- va (VA)**—Abbreviation for volt ampere. A designation of power in terms of volts and amperes. Used primarily to indicate the power capabilities of a transformer.
- V antenna**—*See* antenna, V.
- vacuum capacitor**—*See* capacitor, vacuum.
- value**—British term for an electronic tube.
- varactor**—A variable reactance element used in parametric amplifiers, frequency control circuits, etc. A PN junction that can be used as a voltage-variable capacitor.
- variable-frequency oscillator (VFO)**—*See* oscillator, variable-frequency.
- variable-reluctance microphone**—*See* microphone, reluctance.
- Variac**—Trade name for an autotransformer wound on a toroidal core and containing slides over the winding to provide a continuously variable output.
- variocoupler**—A transformer composed of two coils arranged so that one can be rotated with respect to the other and thereby change the amount of energy transferred from one to the other.
- variometer**—Two coils connected in series with one coil mounted so that it can rotate inside the other. Rotating the inner coil changes the total inductance of the pair.
- V-beam antenna**—*See* antenna, V-beam.
- Vee antenna**—*See* antenna, V.
- velocity of propagation**—*See* propagation velocity.
- vernier dial**—A tuning arrangement whereby the tuning knob must be rotated several times to move the tuning shaft one revolution. This system permits extremely accurate tuning of a radio or other electronic equipment.
- vertical antenna**—*See* antenna, vertical.
- vertical-incidence transmission**—*See* transmission, vertical incidence.
- vertical radiator**—*See* radiator, vertical.
- very high frequency (VHF)**—*See* band, VHF.
- very low frequency (VLF)**—*See* band, VLF.
- VFO**—Abbreviation for variable-frequency oscillator. *See* oscillator, variable-frequency.
- VHF**—Abbreviation for very high frequency. *See* band, VHF.
- vibrator**—(1) A device composed of an electromagnet

and a set of points connected in series with the current supply to the coil. Current flow through the coil produces a magnetic field that opens the points and shuts off the current flow. The action causes a repetitive cycle or vibrating motion. (2) Any complete device that incorporates the aforementioned system. (3) A device that is caused to vibrate by applying an alternating current. The vibration is caused by current reversals.

**vibrator power supply**—*See* supply, vibrator.

**virtual cathode**—*See* cathode, virtual.

**visual radio range**—*See* line-of-sight communications.

**vitreous**—Having the characteristics of glass. Made of glass.

**VLF**—Abbreviation for very low frequency. *See* band, VLF.

**voice frequency**—*See* audio frequency.

**voice-operated control**—A system in which the voice is used to initiate a particular action. In a voice-operated transmitter (VOX), sounds above a predetermined level produce a control voltage of sufficient value to close the transmit relay and automatically place the transmitter on the air.

**vol.**—Abbreviation for volume.

**volt**—A unit of electrical pressure. The amount of pressure that will move 1 ampere of current through 1 ohm of resistance.

**voltage**—Electrical potential or electromotive force expressed in volts.

**voltage antinode**—*See* antinode, voltage.

**voltage, contact**—The voltage developed by the contact between two dissimilar substances. Also the voltage developed between a heated cathode and other elements inside a vacuum tube.

**voltage doubler**—A circuit in which both halves of the AC cycle are rectified and then added to produce a DC voltage at the output having approximately twice the amplitude of the peak AC voltage at the input.

**voltage, forward** — Voltage having a polarity that produces a maximum current.

**voltage, ionization**—*See* ionization voltage.

**voltage, line**—The value of the potential existing on a supply or power line.

**voltage node**—*See* node, voltage.

**voltage, peak-inverse** — The maximum voltage that can be applied in a reverse direction to a rectifier with-

- out causing the unit to breakdown or arc-over.
- voltage-regulated power supply**—*See* supply, regulated.
- voltage regulation**—A description of how well the voltage from a power supply, transformer, battery, etc. will maintain its value during input-voltage or output-load changes.
- voltage regulator, line**—*See* regulator, line-voltage.
- voltage-regulator tube** — *See* tube, voltage-regulator.
- voltage, reverse**—Voltage having a polarity that produces a minimum current.
- voltage ripple** — *See* ripple, voltage.
- voltaic**—Used to describe electricity produced by chemical action or the device that produces electricity by chemical action.
- volume compression**—*See* compression signal.
- volume expansion**—*See* expansion signal.
- volume indicator**—*See* meter, VU.
- volume limiter**—A circuit or device that automatically limits the amplitude of the audio signal applied to it.
- volume unit (VU)**—A unit used to designate the number of decibels (db) above a given reference level (generally 1 milliwatt). The volume unit is equal to a decibel when changes in power are involved.
- VOM**—Abbreviation for volt-ohm-milliammeter.
- VOX**—*See* voice-operated control.
- VR tube** — Abbreviation for voltage-regulator tube. *See* tube, voltage-regulator.
- VSWR**—Abbreviation for voltage standing-wave ratio.
- VTVM**—Abbreviation for vacuum-tube voltmeter.
- VU** — Abbreviation. *See* volume unit.
- VU meter**—*See* meter, VU.
- VXO**—Abbreviation for variable crystal oscillator.

## W

**W**—Symbol for watt or wattage.

**watch**—The act of listening on a designated frequency. To monitor a designated frequency.

**watt (W)**—A unit of electric power that is equivalent to the energy represented by 1 ampere flowing under a pressure of 1 volt.

**watt hour**—A unit of electrical energy acting over a given time equal to 1 watt acting for 1 hour.

**wattmeter**—A measuring device that indicates the power moving in an electric circuit in terms of watts.

**wave analyzer, harmonic**—A device for indicating and measuring the harmonic content in a complex waveform.

**wave antenna**—*See* antenna, wave.

**wave, carrier**—Wave energy that can be modulated to convey intelligence. The unmodulated signal transmitted by a radio station. The wave energy about which modulation sidebands exist.

**wave, circularly polarized**—An electromagnetic wave in which the E and H fields rotate with respect to a point in space.

**wave(s), continuous**—A sinusoidal wave in which each

successive peak has the same amplitude.

**wave(s), damped**—Wave energy that decays in time. A wave initiated in a tuned circuit by pulse energy that gradually dissipates. A wave that maintains a constant amplitude is termed a continuous wave.

**wave(s), direct**—A wave that follows a line-of-sight path between the transmitter and the receiver. A wave that undergoes no reflection or refraction.

**wave(s), divergent**—A wave that spreads out from a source. A wave having a spherical surface radiating outward from a point.

**wave(s), E**—The electric component of a transmitted electromagnetic wave.

**wave (electric)**—An electrical disturbance propagating through a medium in such a manner that any value or quantity of the disturbance will have the same relation to time as the disturbance has to space.

**wave(s), electromagnetic** — Electric and magnetic fields in the form of wave energy. Examples are radio, light, X-Ray, and heat.

**wave(s), extraordinary**—Designation for one of two components into which a wave

traveling through the ionosphere is divided by the magnetic field of the earth. Also called X wave. The other component is referred to as the ordinary wave (O wave).

**waveform**—A graphical representation of a waveform. Usually, time is represented on the horizontal axis, and the current or voltage value is represented on the vertical axis.

**wave(s), ground**—That portion of a transmitted wave that is associated with both the ground and the troposphere. This does not include waves free of the ground that are either reflected or refracted.

**wave guide**—A system of conductors that confine and guide electromagnetic radiation. Generally refers to hollow tubes of conducting material that guide the waves.

**wave(s), guided** — Any wave that is closely associated with a material and is guided by the material. *Also see* wave guide and G-string.

**wave(s), horizontally polarized**—A radiated electromagnetic wave in which the E field is oriented in a horizontal plane.

**wave impedance**—A ratio of the transverse components of the electric field and the

transverse components of the magnetic field in the same plane of the radiated field.

**wave(s), incident**—A wave, traveling in a medium, that strikes a different propagating medium or a point where the characteristics of the medium change.

**wave(s), indirect**—A radio wave that reaches a receiving antenna after being refracted or reflected, e.g., a sky wave that is reflected by the ionosphere.

**wave(s), interference**—Fading, garbling, and fluctuating signals caused by two waves of nearly the same frequency, or having the same frequency but differing phase, arriving together at the receiver.

**wave(s), interrupted continuous**—(1) A form of radiotelegraph communications in which the carrier is turned on and off by the code pulses. (2) The wave transmitted by this system.

**wave(s), ionospheric** — A radio wave that has been reflected back to earth by one of the ionized layers.

**wave(s), keying**—In radiotelegraphy, the emission from a transmitter during the active portions of a code character. Also called marking wave.

**wavelength**—The distance be-

tween the nodes of a wave. The ratio of the velocity of the wave to the frequency of the wave.

**wave(s), linearly polarized**—A wave that is characterized by having the E field lying in a fixed plane, e.g., a horizontally polarized wave.

**wavemeter**—*See* meter, frequency.

**wavemeter, absorption**—*See* frequency meter, absorption.

**wavemeter, heterodyne**—*See* meter, heterodyne frequency.

**wave(s), modulated**—A wave having one or more characteristics that vary in accordance with the changes in a modulating signal.

**wave(s), ordinary** — One of two components into which a radio wave traveling through the ionosphere is divided by the magnetic field of the earth. The other component is called an X wave, or extraordinary wave.

**wave propagation**—The transfer of energy through or along a medium by wave motion.

**wave(s), reflected** — A radio wave that arrives at the receiver after being reflected from one or more surfaces.

**wave(s), reflected ground** — A radio wave that has been

reflected from one or more surfaces in its propagation along the surface of the earth.

**wave(s), refracted** — A wave caused by the bending of part of an incident wave as it passes from one medium into another medium having a different dielectric constant, e.g., in passing from the atmosphere through an ionized layer in the stratosphere.

**wave(s), sky** — That component of the transmitted wave that travels upward into space. Also a radio wave that is propagated by reflection from the ionosphere.

**wave(s), space**—That portion of the radiated energy comprised of direct and ground waves.

**wave(s), standing** — The stationary pattern of waves produced by two waves traveling in opposite direction on the same transmission line. The existence of voltage and current maxima and minima along a transmission line as a result of reflected energy from an impedance mismatch.

**wave(s), TE** — A transverse-electric wave. A transmission mode in which the E field is transverse to the direction of propagation. The E field lies across the direc-



tion of transmission.

**wave(s), TM**—A transverse-magnetic wave. A transmission mode in which the H field is transverse to the direction of propagation. The H field lies across the direction of transmission.

**wave(s), tone-modulated**—Interrupted continuous waves that have been amplitude-modulated at an audio-frequency rate.

**wave(s), transmitted** — That portion of an incident wave that propagates from one medium into another. Also called refracted wave.

**wave(s), tropospheric** — A wave that is reflected or refracted in the troposphere. Temperature and humidity changes in the lower atmosphere cause a bending of radio waves that permit reception over greater than line-of-sight distances.

**wave(s), vertically polarized** —An electromagnetic wave in which the lines of force in the electric field are at right angles to the earth.

**wave, X**—*See* wave, extraordinary.

**weber**—The practical unit of magnetic flux. One weber equals  $10^8$  maxwells.

**wheel static** — *See* static, wheel.

**wheel-static eliminator** — *See* suppressor, wheel-static.

**whip antenna** — *See* antenna,

whip.

**white noise**—Term applied to random noise, such as that produced by shot effect and thermal agitation within an electronic circuit. Also, the noise produced by the random movement of free electrons in a conductor or semiconductor. Its constant energy per unit bandwidth is independent of the central frequency.

**wide-band ratio** — A ratio of the frequency bandwidth occupied by the signal to the frequency bandwidth of the signal.

**Wien-bridge oscillator** — *See* oscillator, Wien-bridge.

**winding, bank**—A coil-winding method used to reduce distributed capacity. Basically it consists of single turns wound successively in two or more layers with the entire winding proceeding from one end of the coil to the other without being returned.

**winding, basket**—A criss-cross method of winding a coil to reduce the distributed capacity between turns. Each turn is placed in such a manner that adjacent turns are greatly separated, except at points where the conductors cross.

**winding, primary**—The input winding on a transformer. When two or more coils are

used to inductively couple energy from one to another, the coil connected to the energy source is called the primary and any coil delivering power to a load is called the secondary.

**winding, secondary** — The winding on a transformer that delivers power to a load. The output winding.

**wire, annealed**—Wire that has been softened by a process of heating.

**wire, fuse**—*See* fuse wire.

**wire, litz**—A form of wire that gives reduced skin effect. It consists primarily of a number of fine separately insulated wires that have been interwoven so that each strand assumes all possible positions in the cross section of the entire conductor.

**wire, radio-resistance**—A type of high-voltage cable used in automotive ignition systems to suppress the pulse-type electrical noise produced by that system. Gen-

erally used in place of resistor-type spark plugs.

**wire, shielded**—A wire composed essentially of a center conductor, an insulating material, and an outer shielding conductor. The shielded conductor may be used to prevent pick up of stray electric fields and/or to provide protection against physical damage to the inner conductor.

**WWV**—Call letters of the radio station of the National Bureau of Standards in Washington D.C. This station provides numerous radio broadcast technical services, e.g., time signals, audio- and radio-frequency standards, etc.

**WWVH**—Call letters of the radio station operated by the National Bureau of Standards in Mani, Hawaii. It provides the same services as WWV, except that it covers many locations not served by WWV. (*Also see* WWV.)

## X

**x**—Symbol for reactance.

**x axis**—An axis of a quartz crystal used as a reference in cutting.

**xenon**—A somewhat rare gas employed in some thyratrons and other gaseous electron tubes.

**X M T R**—Abbreviation for transmitter.

**Xtal** — A b b r e v i a t i o n for crystal.

## Y

**yagi antenna**—*See* antenna, yagi.

**Y axis**—In a quartz crystal,

a line perpendicular to two faces of the hexagon-shaped crystal.

## Z

**Z**—Symbol for impedance.

**Z axis (modulation)**—As related to a cathode-ray oscilloscope, the line parallel to the beam travel. The beam is modulated by changing the grid-to-cathode potential.

**zener breakdown** — Reverse conduction through a diode similar to the breakdown of the gas in a gas-discharge tube. (*Also see* avalanche conduction.)

**zener diode**—A diode, usually silicon, that is designed to break down, or avalanche, when the applied voltage reaches a given value. The breakdown is analogous to the ionization that occurs in a gas-type voltage regulator. The breakdown potential is fairly constant over a considerable current range. (*Also see* avalanche

conduction).

**Zeppelin antenna**—*See* antenna, Zeppelin.

**zero beat**—A condition whereby two signals being mixed together produce no beat note when their frequencies are identical.

**zone of silence**—(1) An area where normal radio signals cannot be received. More specifically, an area between the points where ground-wave reception becomes too weak for detection and sky waves first return to earth. (2) An area surrounding a sound source in the atmosphere where sounds originating from the source cannot be heard. They can, however, be heard at distances outside this area. (*Also see* cone of silence.)

# NOTES



# NOTES

# NOTES





# **Dictionary of Electronics Communications TERMS**

by **THE HOWARD W. SAMS ENGINEERING STAFF**

This dictionary represents a unique presentation of terms relating to the communications field. It includes not only those terms commonly associated with commercial two-way radio, microwave, and standard broadcast, but also with amateur radio, Citizens band radio, and many other aspects of radiocommunications.

Over 2,500 entries are included with authoritative and concise definitions that have been thoroughly cross-referenced so that related entries automatically lead to a clear understanding of the term. Each term is clearly defined, and in many cases references are made to closely related terms, adding to the overall comprehension of the subject. For example, there are more than 100 listings under "antenna." Following an authoritative definition of the general term, there are such diversified types as Adcock, biconical, coaxial, discone, etc. Terms pertaining to antennas, such as antenna element, antenna gain, etc., are also included. A unique feature of this dictionary is the definition of the relatively obscure slang and colloquial terms commonly used in radiocommunications.

Every effort has been made to make this book as easy to use as is humanly possible. All terms are listed in bold-face type. Catchwords at the top of each page show the beginning and ending words of the two facing pages. All terms are listed in a strict alphabetical order without regard to separations or punctuations.

**Dictionary of Electronics Communications Terms** is designed to fulfill the needs of engineers, technicians, radio amateurs, CB'ers, and everyone interested in the technical aspects of radiocommunications.



**HOWARD W. SAMS & CO., INC.**  
**THE BOBBS-MERRILL COMPANY, INC.**

\$3.95  
COM-1

Digitized by Google

Original from  
UNIVERSITY OF CALIFORNIA



Gaylord  
PAMPHLET BINDER  
Syracuse, N. Y.  
Stockton, Calif.

347065

Sams (H.W.) & Company,  
inc., Indianapolis.

Dictionary of  
electronics communica-  
tions terms.

TK6  
S28

PHYSICAL  
SCIENCES  
LIBRARY

LIBRARY  
UNIVERSITY OF CALIFORNIA  
DAVIS

trans. to PSL 8.4.72

UNIVERSITY OF CALIFORNIA-DAVIS



3 1175 01263 5986





Digitized by Google

Original from  
UNIVERSITY OF CALIFORNIA